

COMPUTING FOR BUSINESS AND HOME

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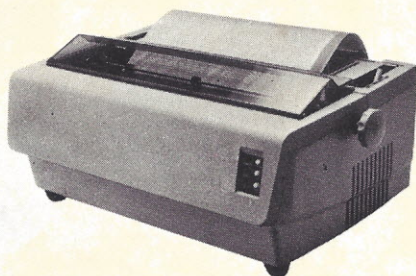
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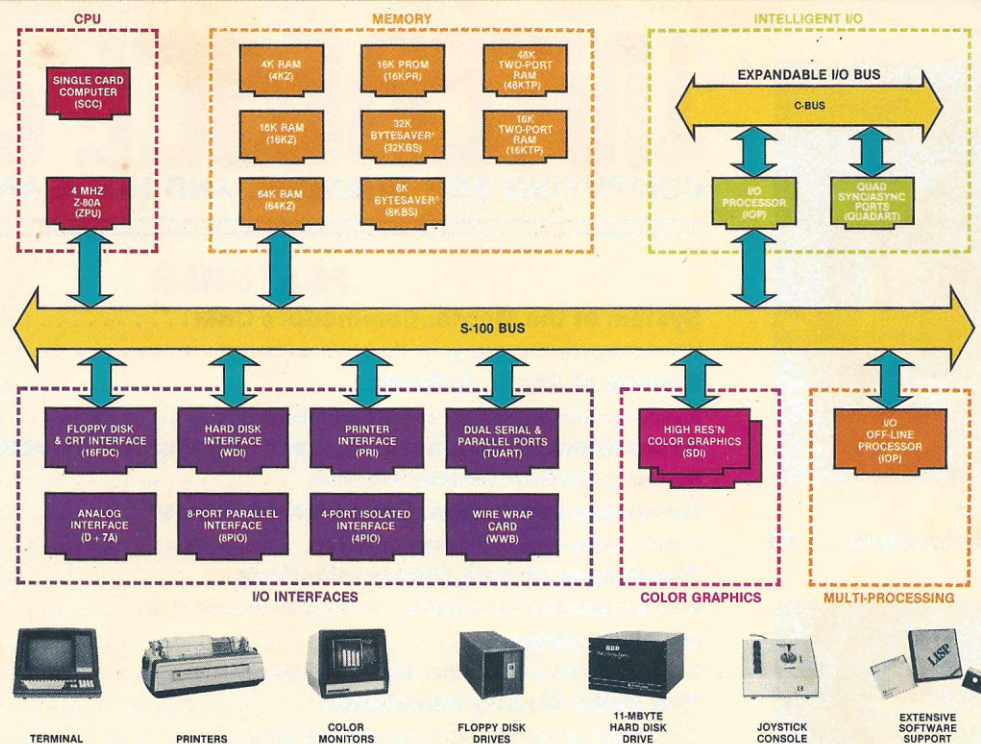
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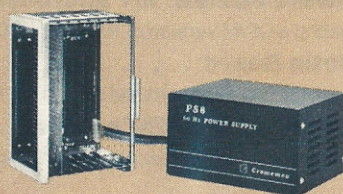
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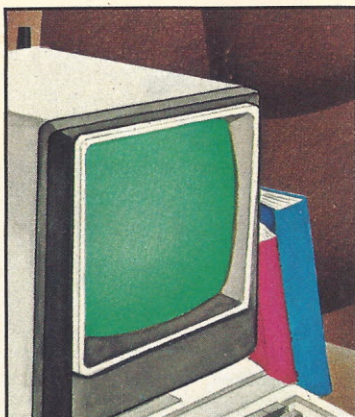


# INTERFACE AGE™

COMPUTING FOR BUSINESS AND HOME APPLICATIONS



**The Future of  
Data Communications . . . 66**



**Quick Register . . . . . 72**



**The Video Display  
Revolution . . . . . 76**

## FEATURES

- System of the Month: Commodore CBM** . . . . . by Tom Fox  
Home computer dressed up for the business market. . . . . **44**
- Sounds of Atari...in Basic** . . . . . by Herb Moore  
Achieving random computer sound generation. . . . . **48**
- Assignment: Benchmark - Factors in Computer Selection** . . by Hillel Segal  
Reviewing criteria for computer evaluation. . . . . **52**
- Hardware Evaluation: Epson MX-80 Printer** . . . . . by Roger H. Edelson  
Output quality to rival high-priced systems. . . . . **58**
- The Future of Data Communications** . . . . . by Bernard Conrad Cole  
What's in store for the computer communications arena? . . . . . **66**
- Quick Register** . . . . . by Chuck Atkinson  
Program to print a sales ticket while updating inventory. . . . . **72**
- The Video Display Revolution** . . . . . by Larry C. Raymond  
Comparison of the latest terminal hardware units. . . . . **76**
- Local Packet Networking** . . . . . by Bernard Conrad Cole  
Considering alternatives to PABX telephone switching. . . . . **84**
- Telecommunications and the Consumer** . . . . . by Robert J. Hustwit  
Satisfying the communication needs of the marketplace. . . . . **90**
- Maintain your Memory** . . . . . by T. J. Byers  
Caring for your cassette mass storage system. . . . . **92**
- Software Review: MT Microsystem's Pascal/MT +** . . . . . by Alan R. Miller  
Evaluating a CP/M version of Pascal for 8080 or Z80 systems . . . . . **94**
- Bulletin Board** . . . . . by David D. Busch  
Program for message retrieval among several users. . . . . **98**
- Stripping with CP/M's Editor** . . . . . by David Lutz  
Program to strip a program of its REMarks. . . . . **100**

## COLUMNS

- Jurisprudent Computerist:** Legal and tax update . . . . . **19**
- Game Corner:** Software clock—in color . . . . . **20**
- Inventor's Sketchpad:** Device for the handicapped . . . . . **27**
- Micro Mathematician:** Quadratic equations . . . . . **28**
- Learning with Micros:** Educational computing publications . . . . . **34**
- Business Software Review:** Memorte III and Execuplan . . . . . **36**
- Apple-ications:** An Apple for energy . . . . . **40**

## DEPARTMENTS

- |   |  |
|---|--|
| <b>Editor's Notebook</b> . . . . . <b>6</b>     | <b>New Products</b> . . . . . <b>102</b> |
| <b>Letters to the Editor</b> . . . . . <b>8</b> | <b>Calendar</b> . . . . . <b>138</b>     |
| <b>Update</b> . . . . . <b>12</b>               | <b>Book Reviews</b> . . . . . <b>140</b> |
| <b>Free Literature</b> . . . . . <b>144</b>     |  |

Contact authors of monthly columns by writing to them at INTERFACE AGE, P.O. Box 1234, Cerritos, CA 90701 in care of their respective columns.

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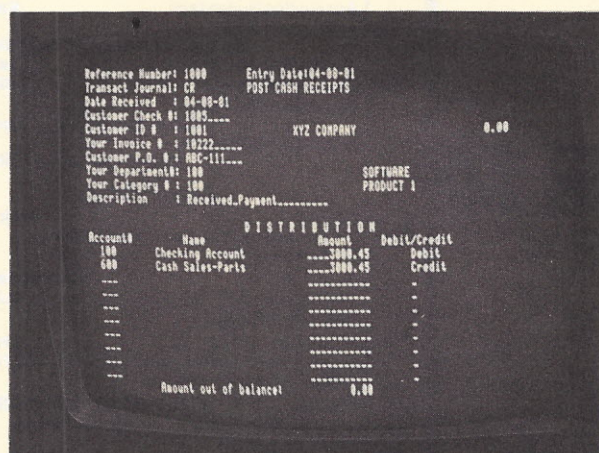
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# Computerize your bookkeeping without terrifying your bookkeeper.

Introducing The Boss.™ the most advanced, yet most understandable, financial accounting system. Designed to automate your bookkeeping without confusion or mistakes.



Typical screen format - actual photograph.

If "fear of the unknown" is standing between you and computerization, you should find out about The Boss.

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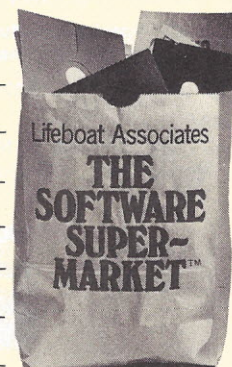
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3:10 P.M. - *System Down!*

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*Board replaced and  
system back on line.*

# DIAGNOSTICS II

Diagnostics II is SuperSoft's expanded Diagnostic package.

Diagnostics II builds upon the highly acclaimed Diagnostics I. It will test each of the five areas of your system:

Memory      Terminal      Printer      CPU      Disk

### Every test is expanded.

Every test is "submit"-able. A "submit" file is included in the package which "chains" together the programs in Diagnostics II, achieving an effective acceptance test. All output can be directed to a log file for unattended operation, for example over night testing. Terminal test is now generalized for most crt terminals. A quick-test has been added for quick verification of the working of the system.

The memory test is the best one we have encountered. It has new features, including:

- default to the size of the CP/M Transient Program Area (TPA)
- printout of a graphic memory map
- bank selection option
- burn in test
- memory speed test

Diagnostics-II still includes the only CPU test for 8080/8085/Z80.

A Spinwriter/Diablo/Qume test has been added, which tests for the positioning and control features of the Spinwriter/Diablo/Qume as well as its ASCII printing features. (Serial Interface only)

And, as with all SuperSoft products, a complete online HELP system and user manual is included.

Price: \$100.00 (manual only): \$15.00

Requires: 32K CP/M

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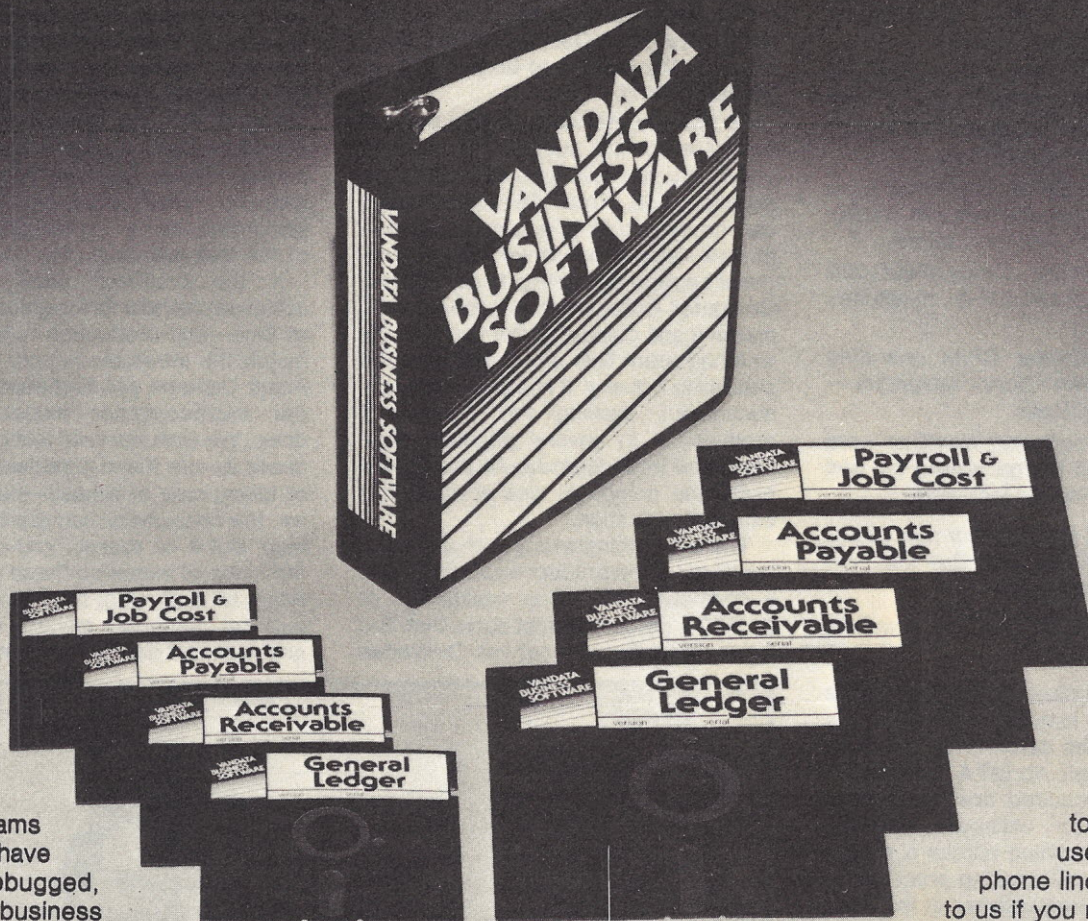


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The checks and statements fit standard forms readily available from mail-order forms suppliers. You have your choice of a number of different formats.

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Minimum requirements are 48K RAM, CP/M™ or CDOS, CBASIC2, a CRT, and a 132-column printer. We can provide standard 8", NorthStar 5" double-density, or Heath/Zenith 5" diskettes — call for availability of other formats. The price is \$295 per system, or \$995 for the complete set of four.

For more information, write VANDATA, Suite 205, 17544 Midvale Ave. N., Seattle, Wa. 98133, or call (206) 542-7611.

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# EDITOR'S NOTEBOOK

## Challenge for the computer industry

Five years ago, the new computer described below would be a rare and precious possession at any price. Today, it's commonplace. Its specifications would scarcely cause a stir at your neighborhood computer store. Here they are:

**Configuration:** A single box containing computer, dual floppy disk drives, keyboard and display screen.

**Electronics:** A Z80A microprocessor running at 4 MHz, 64K bytes of user memory and interfacing electronics for a variety of external devices.

**Input/Output:** 67-key typewriter-style keyboard with numeric pad and display screen holding 1,248 characters.

**Peripherals:** Online storage of 200,000 bytes of data on two 5¼-in. minifloppy diskette drives.

**Systems software:** CP/M operating system and two Basic languages—Microsoft and CBasic.

**Applications software:** WordStar word processor, Mail Merge mailing list and SuperCalc (a VisiCalc look-alike).

Ho hum, you say. Another new micro. Sounds like all the rest. But wait! We forgot one specification:

**Price:** \$1,795, quantity one, complete as described.

Eighteen hundred dollars! Why, the software alone lists for well over a thousand! What's the catch? Who is making it? A philanthropic Apple? A Radio Shack with a short-circuited cost accounting department? An unknown scientific genius who stumbled across a revolutionary new manufacturing process?

Nope. A writer/publisher in the computer industry. Imagine that.

Long-time readers of *Interface Age* may remember Adam Osborne for his pithy *From the Fountainhead* column. He has since moved on to writing and publishing technical books, and has turned out some fine tutorial texts in the microcomputing field. We recommend them all the time.

Adam called us early this year to announce excitedly his plans to forsake all of this to become a computer manufacturer. He painted a glowing word picture of the machine we just described; though, at that time, it existed but as a rat's nest of wires and parts in bread-board stage. In the intervening months, the computer took shape and was duly (if not humbly) dubbed the Osborne I. Adam missed on only one detail: In January, he was talking about a \$1,400 price tag. Well, inflation has been hard on us all of late.

How can a mere outsider do what a booming industry cannot manage—produce a system at half the cost (or less) of similar-performing competition? According to Adam, any one of the existing computer manufacturers could have turned the trick if they wanted to. His own words: "My action is a stinging indictment of the existing microcomputer industry." He believes any one of the giants could match his prices if they really tried. If the Osborne I takes off as planned, they'll have to do just that, or get left behind.

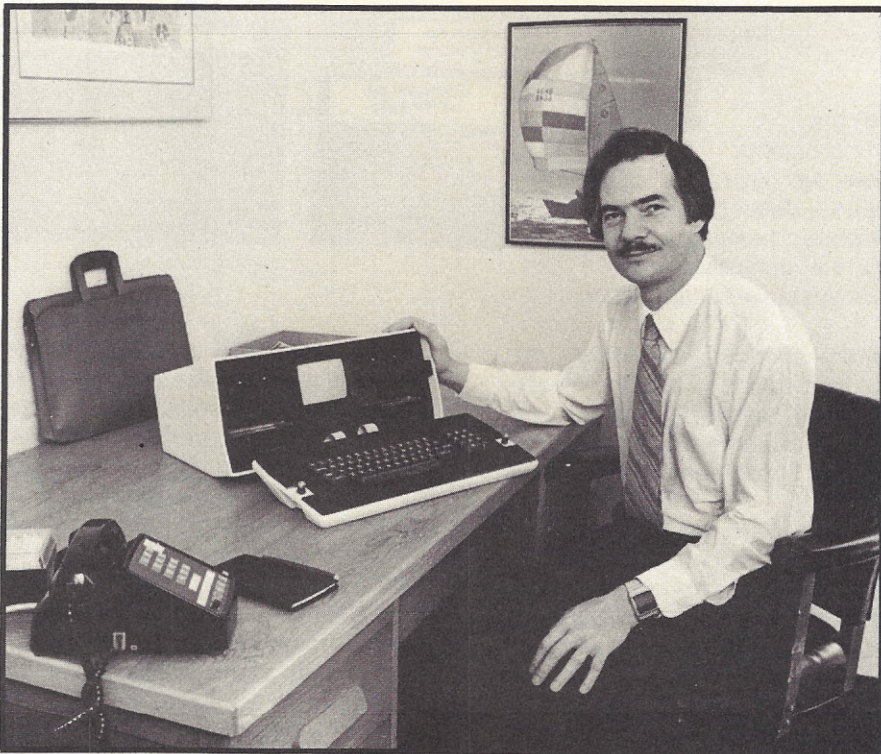
As much as we would like to see our former associate succeed in his new endeavor, you will have to color us a skeptical hue. *From the Fountainhead* was never one to take a press release at face value, nor will we. The promotional barrage emanating from Osborne Computer Corporation has been slick, massive and guided by the hand of one who has spent time on the inside of the publishing industry. It has been singularly successful, earning the Osborne I prominence in several popular magazines and trade journals. All this before even one computer was available for external evaluation.

There's nothing wrong with publicity, mind you, if the product warrants it. And a computer with these capabilities at \$1,800 is news, no doubt about that. But it hasn't happened—not yet. Deliveries

*should* be starting as you read this, but the schedule has slipped twice already, so don't hold your breath. (Osborne is hardly alone with this problem. Volume deliveries of the Apple III began at least six months later than promised.)

And that price tag...will it hold? Even Adam admits his machine is so ordinary it would be tough to sell if it were priced squarely with the competition. Even with his years studying the industry, we suspect he is seriously underestimating the cost to produce, sell and support the Osborne I. As so many have learned the hard way, the hidden expenses of documentation, quality control, distribution, dealer training and support, warranty repair, etc., can become a significant—even dominating—portion of the true manufacturing cost.

If the promised price target is achieved and held for a significant period of time—and production ramped up to match the inevitable hungry demand—Adam Osborne will singlehandedly turn the microcomputer industry upside down. We wish him luck. Not because he needs it—our friend is perfectly capable of taking care of himself—but because we, the consumers, can use that kind of help. But if he misses, you can expect the kinds of words on these pages that Adam himself might have written about budding computer makers who make promises and don't keep them. □ —TF



Family portrait: Osborne I and daddy Adam



At Hayes, we don't believe in second best. Or planned obsolescence. We believe in taking the state of the art to the limit. Our new Smartmodem, for example, is the most sophisticated 300-baud originate/answer modem you can buy. And yet, it is perhaps the easiest-to-use modem ever.

**RS-232C Compatible.** Smartmodem lets any RS-232C compatible computer or terminal communicate by phone with other computers and time-sharing systems located *anywhere in North America*. You get full and half-duplex operation with both Touch-Tone® and pulse dialing.

**Auto-Answer/Dial/Repeat.** Smartmodem can answer the phone, dial a number, receive and transmit data, and then hang up the phone — automatically! If desired, Smartmodem will even repeat the last command. You can depend on Smartmodem for completely unattended operation.

**Completely Programmable.** Smartmodem can be controlled using

# Hayes Stack™

## Microcomputer Component Systems

any programming language. Over 30 different commands can be written into your programs or entered directly from your keyboard.

Smartmodem also includes several switch-selectable features that let you tailor performance to your exact needs. You can "set it and forget it" for the ultimate in convenience.

**Built-in Audio Monitor.** Thanks to an internal speaker, you can actually listen to your connection being made. You'll know immediately if the line is busy or if you reached a wrong number —

and you don't even need a phone!

**Status at a Glance.** Seven LED's indicate Smartmodem's current operating mode: auto-answer, carrier detect, off hook, receive data, send data, terminal ready and modem ready. You're never left in the dark!

### Direct-Connect Design.

Smartmodem is FCC registered for direct connection to any modular phone jack — there's no acoustic coupler to cause signal loss and distortion.

**Smartmodem, Smart Buy.** Professional quality features. Versatile performance. A full two-year limited warranty. A suggested retail price of only \$279.

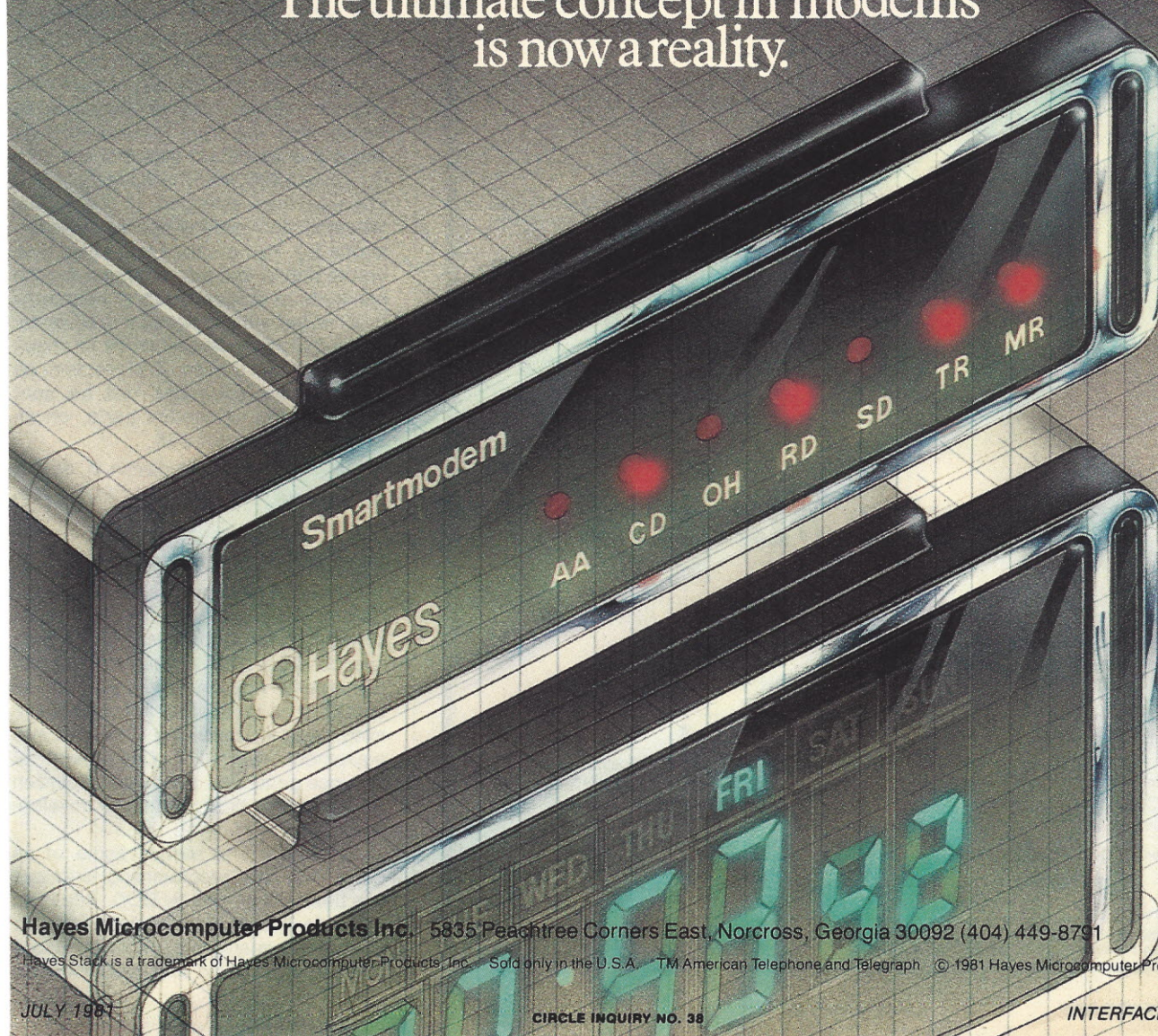
What more could you want? Perhaps the matching Hayes Stack Chronograph, an RS-232C compatible calendar/clock system.

Check out the Smartmodem wherever fine computer products are sold.

And don't settle for anything less than Hayes.



Smartmodem.  
The ultimate concept in modems  
is now a reality.



Hayes Microcomputer Products Inc. 5835 Peachtree Corners East, Norcross, Georgia 30092 (404) 449-8791

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# LETTERS

## Bar code advocate

Recently I discovered a commercially available type element from IBM, the DF-2, part number 1167659, which combines letters and a system of machine readable bar-code. The element is supposed to cost about \$18, and is an over-the-counter item.

In light of recent developments in the field, particularly by Hewlett-Packard and others, resulting in the introduction of a reasonably affordable bar-code

reader, it is becoming increasingly apparent that the time has come to begin publication of computer-listings in bar-code format. A source of already generated code will certainly hasten the final development of more, better and less expensive bar-code readers.

For some reason, many popular magazines are still publishing listings in nearly, if not completely, illegible form: the dot-matrix. Even when reproduced well, dot-matrix printing is difficult to

read. When reproduced for publication, even with care, much is lost before the reader has his chance to decipher it. There is entirely too much room for error in the reader's attempt to interpret what was intended. Your recent articles have led me to believe that, perhaps, your magazine is the one that is forward-thinking enough to pioneer.

If printed with ordinary care, and read with the proper equipment, there is a remarkable advantage to bar-code—speed and accuracy. That's what computers are all about, right? I am not saying that this IBM element is the ultimate in solutions; just a good beginning. Please consider it in your publications and perhaps you will be the winner with increased readership.

M. A. Fincher  
Baton Rouge, LA

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an application that interests everyone .....  
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## Vote of confidence

When post-warranty service from a micro manufacturer can be described only with superlatives such as "exemplary," the time has come to bring it to your readers' attention, especially in a field noted for its past lack of customer support. When I called Dynabyte in Menlo Park, CA from London, Canada about an intermittent disk problem with Dynabyte 5200 after the warranty period expired, they arranged to have Roy Wheaton, their national service manager, phone me. He not only spent some time on the phone, but also arranged to rush hundreds of dollars worth of new parts by air to me without payment in advance, and called back several times to check whether it had arrived. The problem, an auxiliary disk controller, will be sent back with the unneeded parts, on an exchange bases for \$65.

Benjamin D. Singer  
London, Canada

## Government supports Ada

In a report to Congress April 5, 1979, Deputy Undersecretary Dr. Ruth Davis stated that the Department of Defense spends \$3 billion a year to program computers. Approximately 90% of all spending on computers is for programming, while the remaining 10% goes into equipment. The U.S. Department of Defense generates a substantial portion of all software or programming development today.

As an effort to reduce some of its costs, the Ada programming language has been developed by DOD. Ada is an effort to standardize programming for imbedded systems in DOD. It will replace other DOD-approved languages; increase



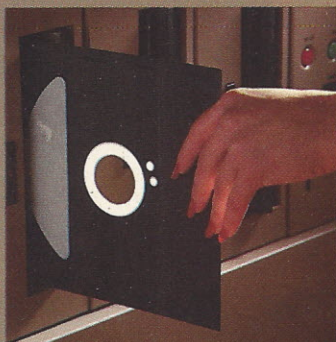
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With the Scotch head-cleaning diskette kit, you could save yourself a lot more than just a service call. So try this remarkable kit today. For the name of



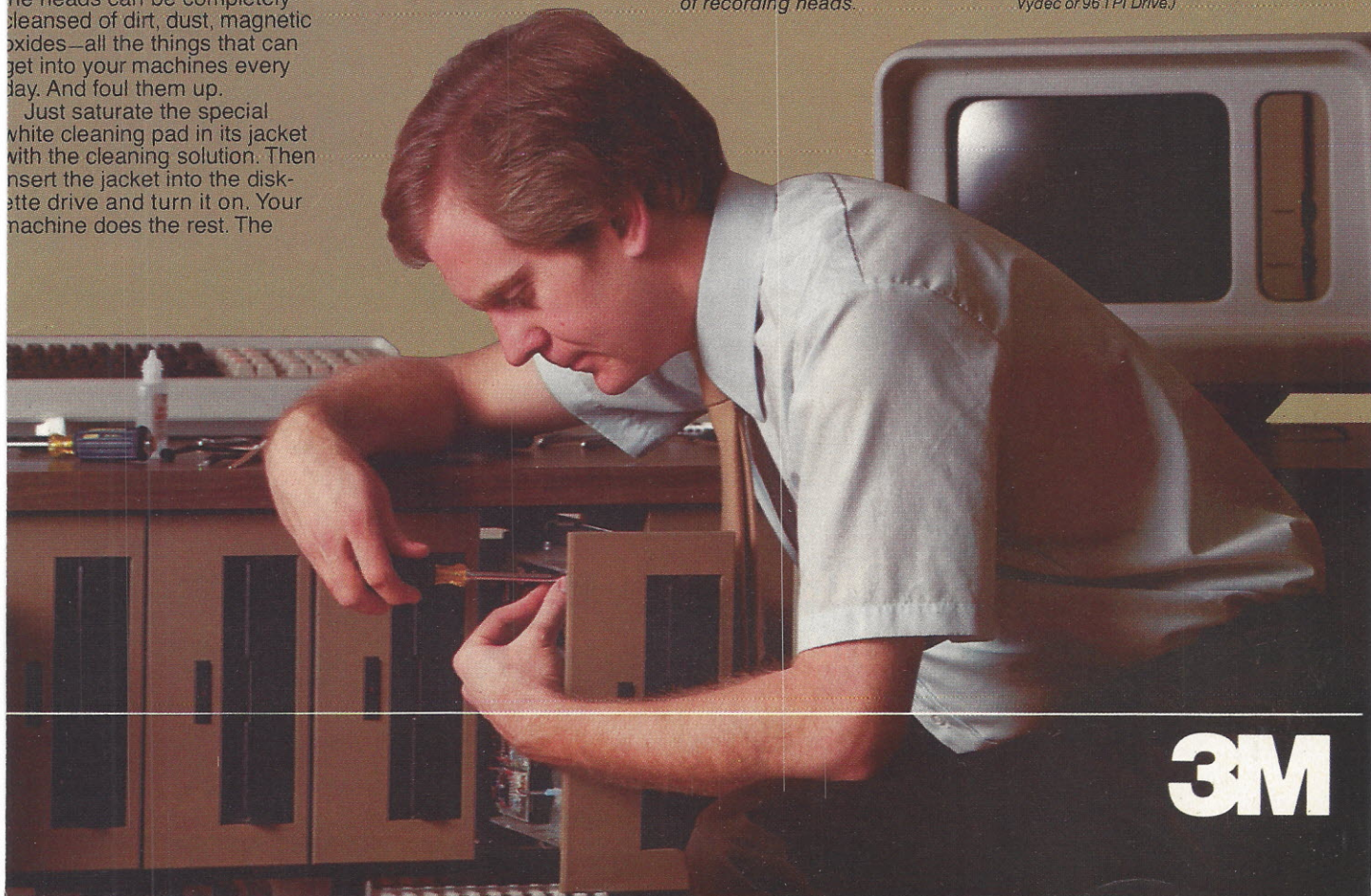
*A Scotch cleaning diskette shown  
before use, and after 15 cleanings  
of recording heads.*



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Up to 12 font selections may be stored in the printer and interchanged while printing.

The Dual-Mode 200 accepts standard daisy wheel print commands for word processing system compatibility.

It's the perfect solution for the two printer problem.

## The Dual-Mode 200 Printer for the one printer office.

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## LETTERS

reuseability of software from project to project; and increase transferability of the "environment" including programmers, debugging tools and methods of documentation. It is expected to become as well known as Cobol or Fortran. This language was developed through coordination and sponsorship of the military departments and agencies of the Department of Defense.

The Superintendent of Documents, U.S. Government Printing Office, has made available the Department of Defense *Reference Manual for the Ada Programming Language*. The stock number is 008-000-00354-8.

Further information is available from Superintendent of Documents, U.S. Government Printing Office, Dept. 50, Washington, D.C. 20402.

C.A. La Barre  
Assistant Public Printer  
U.S. Government Printing Office

### Sour note

Louis Frenzel's "Learning with Micros" (IA Feb 81) states that very little educational software is available for microcomputers. I am presently involved in a project that seeks to determine what educational programs are available in the field of music education and would be suitable for use in schools. Your comments appear to echo what I have found to date—"there are few viable software sources."

Cecil H. Pretty  
Eugene, OR

### Language interpreter

In the article "A Hardware Solution for a Software Problem" (IA Apr 81), Roger Edelson states that "the excellent operating system...is apparently not translatable into 6502 assembler language." The CP/A written by Shepardson Microsystems includes a Basic and a Business Basic (with USING) and an editor/assembler as well as an operating system that appears and functions like CP/M. The documentation reads a lot like Digital Research CP/M which means that it is not for the novices.

Al Hamilton  
Springdale, OH

### Follow up with Wang

Re: WordStar Software Review (IA Mar 81), from Alan Miller's description, WordStar shares many similarities with Scripsit and Digital's small system word processing software. In my opinion, these do not compare to the ease and flexibility of Wang's word processing software and system. I believe it would

be very useful if you would do a follow up article comparing WordMaster and WordStar to Wang's system operating on a Wang 5 and Wang 25.

Alan D. Sugarman  
New York, NY

### Reader interface

I would appreciate information about the use of computers in audio-visual presentations. My company produces A-V presentations that involve 3-15 slide projectors controlled by a computer system designed especially for this purpose. I would like to purchase a non-dedicated computer that could be used to control multiple slide projector shows. This would allow me to use the computer for general business purposes as well. I have heard that there are companies that customize Apple computers for A-V applications.

Daniel Ginensky  
CVM Productions  
55 W. 16th St.  
New York, NY 10011

My computer, the TI-99/4, is relatively new in Australia. To my knowledge, there are still no users groups here for Texas Instruments. I would like to correspond and swap ideas and programs with other users.

Shane Andersen  
P.O. Box 101  
Kings Cross  
Sydney, Australia 2011

Is there anyone who can help me get ahold of technical data on a Selectric-based input-output unit labeled Edityper? Apparently, it was a product of Epsco, and later of Tycom Systems Corp. I'd be grateful for the loan of a manual on it for a few days.

Dr. Fred Orway  
2901 Telestar Ct.  
Falls Church, VA 22042

I am interested in learning about the field of computer graphics. I am presently designing greeting cards and investigating the possibility of computer graphics as a new career. Any information about computer graphics would be appreciated, especially on specialized training or education for work in this field.

Marcia D. Allen  
127 Spring Rd.  
Scotia, NY 12302

I am seeking information on interfacing a paper tape punch (part of an Addressograph-Multigraph phototypesetting system) to a Wang MVP computer.

Toby Mommsen  
Hutterian Society of Brothers  
Rifton, NY 12471

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CP/M, TRS-80 and IBM are T.M.'s of Digital Research, Tandy Corp. and I.B.M. respectively.



**ELLIS COMPUTING**  
SOFTWARE TECHNOLOGY



## Microcomputer becomes a fashion designer

Knit design and the microcomputer have been interwoven in a unique program at Sheridan College, Ontario, Canada.

Pat Gwyer, co-ordinator of Fashion Technique and Design, said Sheridan is the first institution in North America to introduce the concept of computerized knit design in its fashion curriculum. It has never been used before in industry or education, she said. She feels it's

important for students to have this knowledge of computer technology and fashion so they are prepared for new advances when they enter the workforce.

Although there are fears that computers may reduce the creativity of students, this has not happened and students like Dominic Bellissimo, 21, say "it's a different way of designing while still using your own creativity."

To design by computer, students punch a button on a microcomputer's

keyboard. Instantly, a design is worked out on its video screen, which students can decide to keep or reject. If they keep it, a print-out is made on a sheet, which is punched on a card, then put into a knitting machine.

Before the computer concept was introduced, students used pattern cards for their machines, either pre-punched by a manufacturer or hand-punched. Fabric designs were limited. Students had to knit a fabric swatch to see if they liked the design, then modify the pattern card if necessary, and re-knit until the design was perfected.

Sandy Aitken, a fashion knit instructor and a former student, said the computer eliminates the laborious effort of first putting a design down on graph paper. "Now, it's possible to get 15 designs in 15 seconds—and then the students can pick and choose." It's the difference, she said, between having a thousand designs to work with and now having hundreds of thousands of designs available to a student.

The system of using a microcomputer to design fashion knits was developed by Bill Apgar, an independent computer graphics consultant. Since October 1980, Apgar has been teaching students in the knit design program about the computer connection and familiarizing them with its hardware, technology and programming.



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## CRTs causing headaches for managers and employees alike

CRT terminals are creating unexpected problems for data processing managers. Staff using CRTs report headaches, eye strain, and sometimes even mental confusion according to Bruce D. Sanders, a Vacaville, CA psychologist.

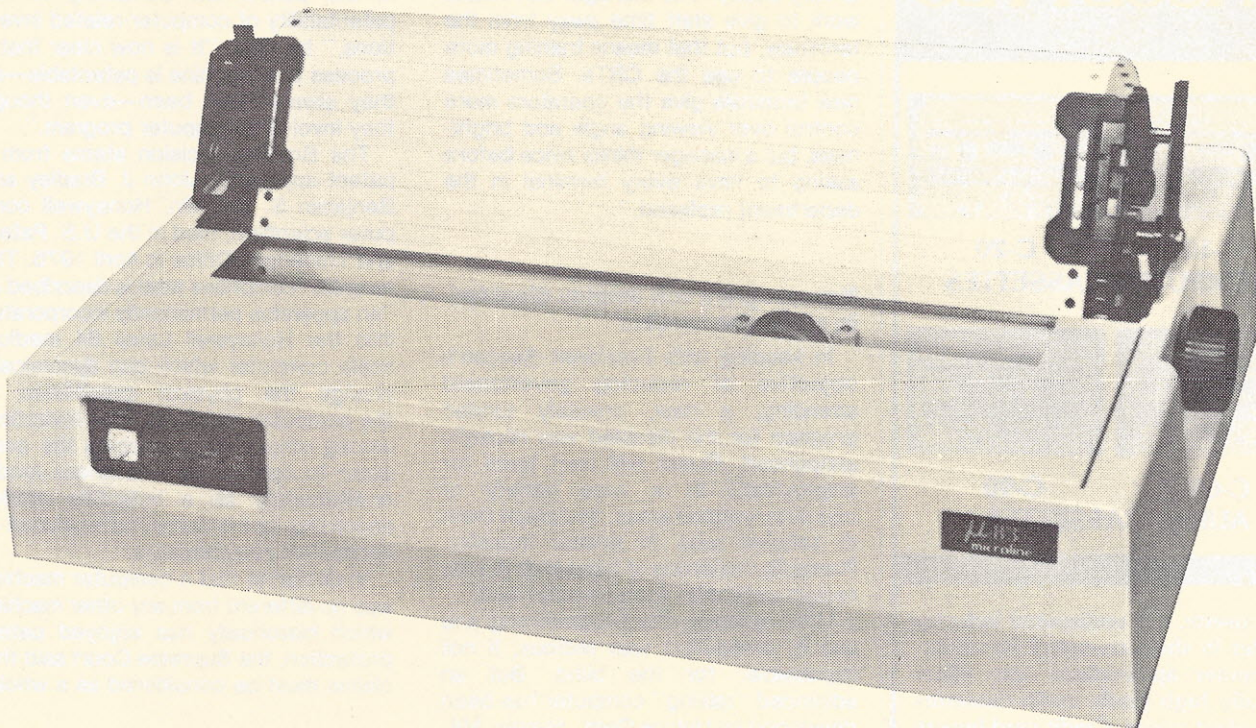
Says Sanders, "Lots of DP managers are worried about the CRTs. The workers who are complaining are usually the ones who put routine information into the computer or get it out. They work right in front of the screen for hours at a time."

"Some users are bothered by the high-pitched whine put out by video tubes. On the home TV, it's less bothersome because you're sitting further from the set. Now that CRTs give color output, the problems are even greater. Some programmers say, 'If we've got lots of colors available, let's use lots of colors.' They forget about the poor users who have to look at those psychedelic screens day after day."

"What makes it all tougher for the DP manager is that the remedies aren't cheap. It may involve changing the computer programs, and programming time



# M = TCR<sup>2</sup>\*



★ M = TCR<sup>2</sup> means **Microline** = Total Commitment to **RELIABILITY**<sup>2</sup> with emphasis on **RELIABILITY!** While **OKIDATA** may be a new comer to the hobbyist, they do have nine years under their belt supplying the nations largest OEM's with printers that *work* day in and day out . . . It is this printer experience and proven track record that makes **reliability synonymous with Microline.**

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Maximum Paper Width	9.5"	15"
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Print Head Warranty	200 million characters*	200 million characters*
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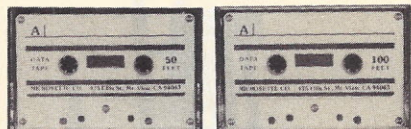
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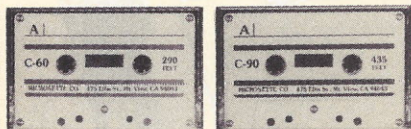
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## UPDATE

is very costly. The manager can rotate work to give staff time away from the terminals, but that means training more people to use the CRTs. Sometimes new terminals give the operators more control over viewing angle and brightness, but a manager thinks twice before asking to have every terminal in the department replaced."

### New program will employ disabled in computer careers

In keeping with President Reagan's objective of reducing government spending, a new, privately funded program for the disabled was recently announced. Quest will train them for employment in a wide variety of computer-related areas, and place them in salaried jobs in private industry. Presently, hundreds of thousands of jobs remain unfilled in the computer field.

Until recently, the programming and use of computers was tedious, if not impossible, for the blind. But an advanced "talking" computer has been developed by Unicos Corp., Hynnis, MA. The computer verbally interacts with the user, allowing the blind to hear, rather than read, both input and output.

The program will ease the shortage of workers, while allowing companies to fulfill equal opportunity and affirmative action commitments in a useful, productive manner. It can even help in areas where mobility is a serious problem—disabled persons can work at home, transferring information to their employer's computers via phone links.

Information on the Quest program is available from National Quest Coordinator, Unicos, 76 W. Main St., Hynnis, MA 02601.

### Machines containing computer programs are eligible for patent

Computer machines are eligible for patent protection, according to a recent decision of the U.S. Supreme Court, handed down in the case of *Diamond v. Bradley*.

In what is generally believed to be a landmark decision, the Supreme Court said that a machine or a process that otherwise meets the requirements for patentability cannot be denied patent protection merely because a part of the machine or process involves a computer program.

"According to this decision, claims must be considered as a whole by the patent office," said N. Prasinos, the patent lawyer who represented Honeywell Corp. of Waltham, MA. "The decision clears up much of the confusion

in the patent law pertaining to the patentability of computer-related inventions," he said. "It is now clear that a process or a machine is patentable—as they always have been—even though they involve a computer program."

The Bradley decision stems from a patent application John J. Bradley and Benjamin S. Franklin, Honeywell computer scientists, filed in the U.S. Patent and Trademark Office in April 1975. The invention comprises what is described as "an apparatus permanently incorporated into the Honeywell Level 64 medium scale computer which can dynamically change the physical capabilities of the computer machine. The invention, among other things, enables the computer to operate as a business model or alternately as a scientific model, according to the computer workload or application requirements."

In declaring that a computer machine was no different from any other machine which historically has enjoyed patent protection, the Supreme Court said that claims must be considered as a whole.

### Engineer devises terminal to aid the partially-sighted

A computer terminal that enables partially-sighted persons and some who are legally blind to work with computers has been invented by M. Daniel Simkovita, a partially sighted engineer at Wayne State University, Detroit, MI.

The Low Vision Terminal (LVTS) allows people with poor vision to read computer output by enlarging individual letters to more than 3 inches in height while the user scans the output at a manageable reading speed. The size of the letters and the speed are both controlled by the user. A specially-designed microprocessor-based system and an ordinary TV screen are used.

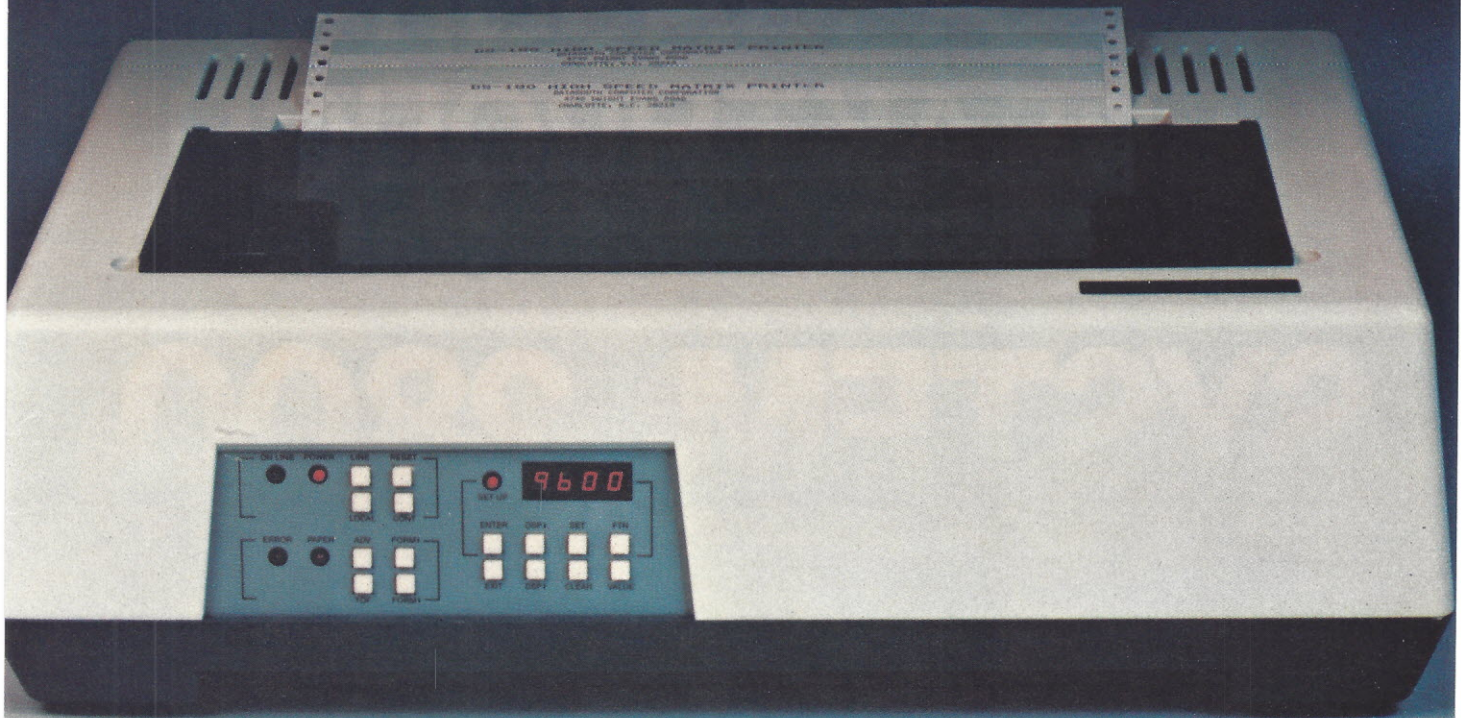
The terminal has a memory unit that enables the operator to review material already displayed, either horizontally one line at a time or by scrolling vertically back and forth through the text.

Dr. Edward Fisher, associate dean for research and graduate programs at Wayne State University says, "There are already devices and programs for those who are totally blind, but, up until now, there hasn't been anything for the partially sighted."

Other applications that he sees are for the secretary who suffers from eye strain after reading a regular screen for 8 hours. "We think it would be helpful to enlarge the lettering toward the end of the day. The secretary would be able to control the size and speed of the letters to suit her needs," he reports.



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With so many matrix printers on the market today, it may seem tough to find exactly the right one for your application. Some models may offer the speed you need, others the communications flexibility and still others the forms handling capability. But no printer offers **all** the features you need...until now.

The DS180 matrix printer provides the total package of performance features and reliability required for applications such as CRT slave copy, remote terminal networks and small to mid-range systems. Not a "hobby-grade" printer, the DS180 is a real work-horse designed to handle your most demanding printer requirements. And pricing on the DS180 is hundreds of dollars below competitive units.

**High Speed Printing**—Bidirectional, logic-seeking printing at 180 cps offers throughput of over 200 lpm on average text. A 9-wire printhead life-tested at 650 million characters generates a 9x7 matrix with true lower case descenders and underlining.

**Non-volatile Format Retention**—a unique programming keypad featuring a non-volatile memory allows the user to configure the DS180 for virtually any application. Top of form, horizontal and vertical tabs, perforation skipover, communications parameters

and many other features may be programmed and stored from the keypad. When your system is powered down, the format is retained in memory. The DS180 even remembers the line where you stopped printing. There is no need to reset the top of form, margins, baud rate, etc....it's all stored in the memory. If you need to reconfigure for another application, simply load a new format into the memory.

**Communications Versatility**—The DS180 offers three interfaces including RS232, current loop and 8-bit parallel. Baud rates from 110-9600 may be selected. A 1K buffer and X-on, X-off handshaking ensure optimum throughput.

**Forms Handling Flexibility**—Adjustable tractors accommodate forms from 3"-15". The adjustable head can print 6-part forms crisply and clearly making the DS180 ideal for printing multipart invoices and shipping documents. Forms can be fed from the front or the bottom.

If you would like more information on how the DS180's low-cost total printer package can fill your application, give us a call at Datasouth. The DS180 is available for 30-day delivery from our sales/service distributors throughout the U.S.

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# ANNOUNCING

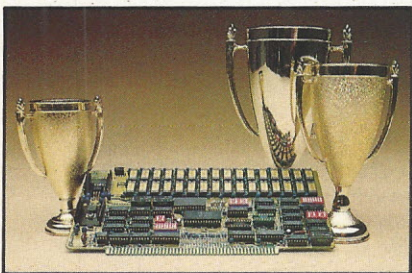
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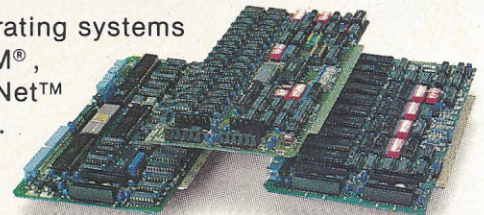


innovative Bank Select switching technique. This enables users to software select up to four totally independent memory banks per board.

### The 2nd Generation

Then came the 2nd Generation of IEEE S-100 COMPATIBLE Z80 PROCESSORS, FLOPPY DISK CONTROLLERS and SERIAL I/O BOARDS. Each has been designed for single user, multi-user or

network operating systems such as CP/M®, MP/M™, CP/Net™ and OASIS™.



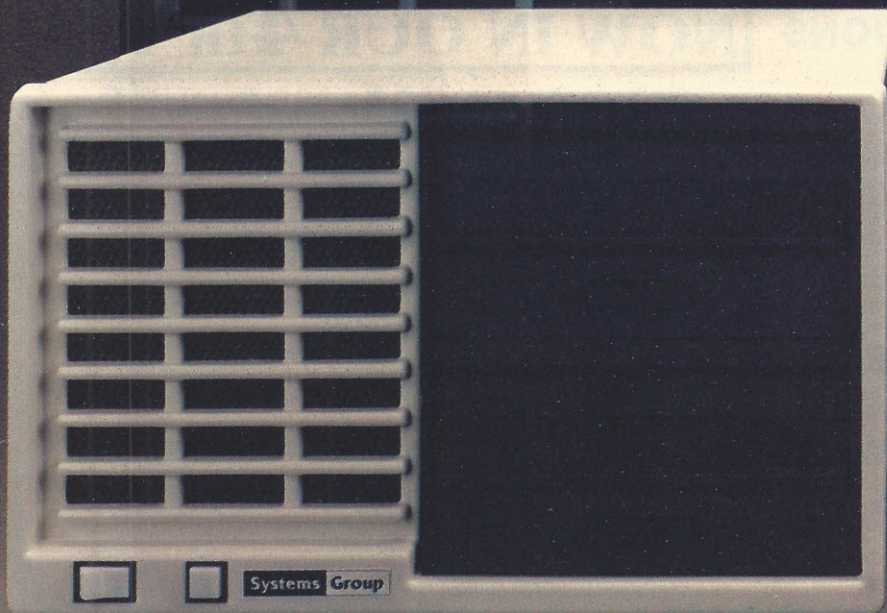
### The Next Logical Step ...

We challenged our design team to create an innovative yet competitive system utilizing our existing line of field proven, dependable S-100 boards. The result: a highly reliable, quality built, state of the art microcomputer that gives you the cost/performance edge you need to be a leader in your field.

The System 2800 comes with a choice of operating systems: CP/M with an enhanced CBIOS for single user systems and either MP/M or OASIS for multi-user, multi-tasking systems. MP/M is available with either a standard or

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enhanced XIOS. The CP/M based System 2800 provides improved diagnostic reporting capability and increased sector sizes of 1024 bytes yielding disk performance throughput increases up to 400% over standard unblocked systems.

The enhanced multi-user, multi-tasking MP/M based System 2800 provides the same advanced features as CP/M. In addition, this interrupt driven implementation can offer performance throughput increases up to 2000% thru extensive disk buffering for applications requiring a large number of disk accesses.

Also available is the OASIS operating system with ISAM files, automatic record locking and multiple-user print spooling.

All operating systems are available in either floppy or hard disk configurations. The disk drive selection includes single or double sided, double density 8-inch floppies with up to 2.52 megabytes of formatted storage per system, expandable to 5.04 megabytes, and an 8-inch 10 megabyte winchester hard disk.

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# JURISPRUDENT computerist



By Elliott MacLennan  
Attorney at Law

## Technological Legal and Tax Update

In the March column, I reported that a 25% R&D (research and development) tax credit "began" Jan. 1, 1981. My information source was Commerce Clearing House Federal Tax Reports, Pending Legislation, paragraph 6167, dated Sept. 3, 1980. This credit has not been enacted. The status of the credit is presently unknown, even to the IRS National Office in Washington, D.C.

It is probably pigeon-holed in a Congressional subcommittee, pending resolution of the present administration's tax package. I will notify readers via this column as soon as I hear further definitive information.

## Nondisclosure agreements

These ultra important agreements in the protection of proprietary property have, in my experience, been misunderstood, misused or, worse, nonexistent. Usually such agreements operate in two environments.

First, an inventor, designer, programmer desiring to seek funds or marketing assistance for his project needs strong legal protection prior to disclosing proprietary information to his potential investors. They, in turn, need full disclosure of the information in order to estimate its commercial worth.

All too frequently, inventors hold back information that is vital to the investment decision, thus negating the transaction because of fear of unauthorized disclosure and usage of their information. Such fear is justifiable. It can be practically eliminated by a correctly drawn nondisclosure agreement. Unlike other legal documents, such agreements are usually under several pages in length.

An attorney who is on the ball will not only utter "nondisclosure agreement" immediately after a developer even briefly discusses the object of his consultation, but should ask his client if he (the attorney) should also sign the agreement.

One universal rule must always be followed in preparing such agreements. Never should an offer to sell or an offer to grant the option be inserted into the agreement unless applicable "Blue Skies" securities have been carefully consulted. In California, for example, such an offer can produce criminal and civil penalties.

The second situation in which nondisclosure agreements are important is in the employer-employee relationship. In a recent case (Cybertek Computer Products, Inc. v. Whitefield et al., CA) a company employee signed a nondisclosure agreement relating to computer software trade secrets he had acquired from his company. Subsequently, the employee voluntarily left the employ of the company and joined a competing firm. Cybertek sued the competing firm for, among other things, relief by injunction for its former employee use of trade secrets, acquired while in Cybertek's employ.

The employee's argument in court was that California law prohibits an employer from preventing a former employee from competing against the prior employer and, therefore,

## Nondisclosure agreements have been misunderstood, misused, or nonexistent...

the nondisclosure agreements were illegal and unenforceable. (This argument is correct in California.)

The court found against the employee (actually his new employer) by holding that, although an employer cannot prevent a former employee from competition in the same area, computer software is a trade secret of proprietary value and is capable of protection.

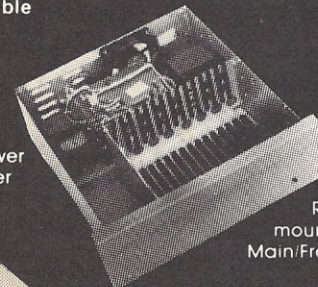
Two points are interesting to note in this case. First, the contents of the employee's *memory* can be enjoined from disclosure to a new employer, even though the human memory is not recorded in a tangible medium. Second, the case arrived in court because, as the court pointed out in its legal decision: "Said nondisclosure agreement is not ideally drafted, and leaves room for interpretation." "Room for interpretation" means unnecessary legal fees.

## Parting shots

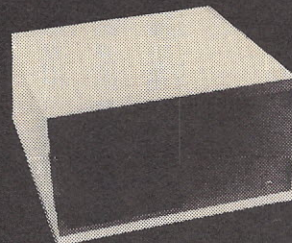
The purpose of this column is to serve as an informational and planning tool. Two common mistakes are made among computer folk—improperly prepared legal agreements and poor tax planning for business operations. I frequently read legal documents relating to computer applications that frankly are not worth the paper they are typed on. A worse situation is to develop a modern technological concept into a commercially successful product or service, only to be taxed back into the Stone Age. A plan for business operations should be definitively set down on paper, with forecasted legal and tax consequences. If the latter two categories are not nailed down, wave goodbye to part of your deductions and profit. □

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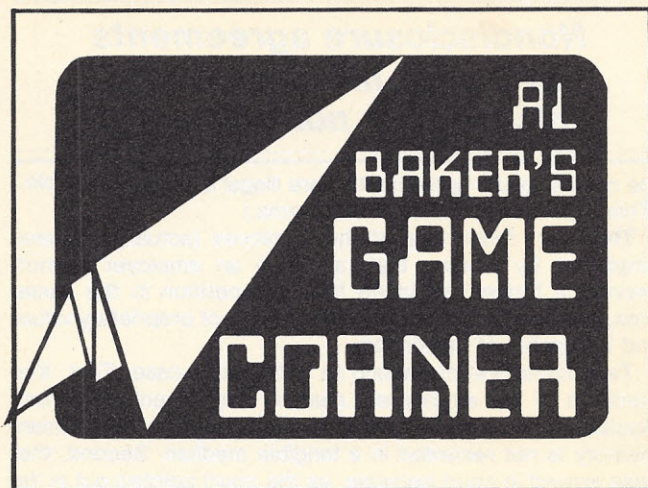
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### The Software Clock

This month's program came from Paul Ruby of Rochester, PA. He sent in a clock program written for the TRS-80 Color Computer and I have converted it to run on the Apple. The program lets you set the clock accurately and set an alarm, and it even ticks off the seconds. It also functions as a stopwatch.

Type the program from lines 10 to 190 exactly as shown. Do not leave out the remarks or the clock will not be accurate. You can leave out the remarks in the remainder of the program, if you want. Run the program. If you want to set an alarm, respond yes when asked and enter the hour and minute you want the alarm to sound. The clock uses the 12 hour format, so don't be alarmed if it goes off at 6:00 PM instead of 6:00 AM. Now set the clock. Type in the current hour, then enter the next minute. At the instant the next minute begins, press RETURN again. The clock will start.

If you want to use the clock as a stopwatch, run the program, don't set an alarm, and type in a starting time of 0 hours and 0 minutes. When the event you are timing begins, press RETURN. At the instant the event stops, press RETURN, or any other key, and the clock will stop, giving you the duration of the event.

As a stopwatch, this program can be quite useful, but don't run your life by it. For one thing, the clock is an extremely trivial use for an Apple computer. For another, it isn't very accurate. Software clocks rarely are. I suspect that this clock is accurate within a few seconds each hour—but just barely. After 24 hours it will be quite inaccurate. It is designed to be used more as a toy than a true timepiece. As such, it is a lot of fun.

Lines 2000 to 2260 are the original TRS-80 program. Paul provided two additional changes to the program, which are also shown. The second, an alarm, was added to the final product. The first, generating a sound every hour, was replaced by a tick each second.

Now look at the final product. Line 1000 clears the TV screen and lines 1010 through 1060 obtain the hour and minute of the alarm setting, if any. Look at line 1020. If the user doesn't want an alarm, the hour of the alarm is set to 99. This creates a simple way of eliminating the alarm without having to put a special test in the timing loop of the program. The program will always test for the alarm time. It just won't ever find it. Finally, the user sets the clock on lines 1080 to 1130.

The clock loop is between lines 110 and 190. Tenths of seconds are kept in variable "C", minutes in "F", and hours in "G". Line 120 updates the minutes counter every time 600 tenths of a second go past. Likewise, lines 130 and 140 do the same for minutes and hours. To make the clock a 24 hour clock, change the 12 to a 23 and the 1 to 0 in line 140. I recommend against this because the clock will run fast from midnight to 1:00 AM. This can be corrected by changing the 12 to 24 and leaving the 1 alone. Then it isn't a true 24 hour clock, but it eliminates the problem of zeros. But more on this later.

Line 160 prints the clock on the screen. The extra blanks at the end of the line clean off the tenths of a second at the start of the next second. Applesoft Basic doesn't clear to the end of a print line automatically. Look closely at line 150. Yes, VTAB is on the line twice, and no, it isn't a mistake. While timing the clock, I finally go to where changing the timing loop on line 185 made the clock either too slow, or a tiny bit too fast. This extra and unnecessary VTAB made the clock's speed just right.

The stopwatch function is performed on lines 170, 240, and 250. If a key is pressed, the memory location at -16384 becomes greater than 127, and the computer goes to line 240. Lines 240 and 250 ring the bell (CHR\$(7)), and loop forever. Lines 180 and 250 control the alarm. If the current hour and minute match the alarm hour and minute, line 230 loops forever while constantly ringing the bell.

The Apple speaker can be triggered by looking at memory location -16336. Line 183 does this twice to cause a ticking sound whenever the clock marks off a second. This happens when there are no tenths of a second, or when  $\text{INT}(C/10) \times 10 = C$ . Prove to yourself that this is true only when "C" is a multiple of 10.

Line 185 is the timing loop. Here is the logic that forces the Apple to make the loop from line 110 to 190 in exactly one tenth of a second. In building this loop, I encountered one major problem. It takes the Apple a lot less time to test the value of "F" in line 130 and print its value in line 160 when  $F = 0$ . Thus the loop on line 185 cycles 9 times when  $F = 0$  and only two times when  $F > 0$ . This solves the problem with zeros and the program is a reasonably accurate software clock.

### Reader response

Some readers have proposed that we publish their converted versions (in Applesoft Basic) of the Mining the Asteroids game (IA Dec 80). The first version I receive that works will

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probably be used in this column. This will be my ongoing policy on program conversions submitted. Awarding the race to the earliest sender seems to be the American way.

Regarding the Player Piano program (IA Jun 80), Dick Plum of Holmdel, NJ has a complaint that other readers share. He owns an Apple III and was unable to run the program. It seems that neither Dick, nor (presumably) the people at the store where he bought his Apple, had ever heard of Apple's Programmer's Aid #1. You can obtain more information about this product by calling Apple at (408) 996-1010. I suspect that there is no equivalent product for the Apple III.

R. Farace was also unable to run Player Piano because of "many error messages." Readers who have trouble with a program from this column should send me a listing. If you don't have a printer, your local computer store should be happy to print one for you, as long as you don't abuse the privilege. I can't help you without one. □

## Revised Apple listing

```

60 REM
70 GOSUB 1000
80 REM
90 REM THE MAIN CLOCK LOOP
100 REM
110 C = C + 1
120 IF C > 599 THEN F = F + 1: C = 0
130 IF F > 59 THEN G = G + 1: F = 0
140 IF G > 12 THEN G = 1
150 HTAB 16: VTAB 10: VTAB 10
160 PRINT G;";";F;";";C / 10;";"
170 IF PEEK ( - 16384 ) > 127 THEN 240
180 IF H = G AND M = F THEN 230
183 IF INT ( C / 10 ) * 10 = C THEN X = PEEK ( - 16336 ):
    X = PEEK ( - 16336 ): X = FRE ( 0 )
185 FOR T = 1 TO 9 - 7 * ( F > 0 ): NEXT T
190 GOTO 110
200 REM
210 REM ALARM AND STOP WATCH ENDINGS
220 REM
230 PRINT CHR$ ( 7 );: GOTO 230
240 PRINT CHR$ ( 7 )
250 GOTO 250
970 REM
980 REM SET UP CLOCK
990 REM
1000 CALL - 936
1010 INPUT "SET ALARM (Y,N)? ";AS
1020 H = 99
1030 IF AS = "N" THEN 1070
1040 IF AS < > "Y" THEN 1000
1050 INPUT "SET HOUR = ";H
1060 INPUT "SET MINUTE = ";M
1070 PRINT : PRINT
1080 INPUT "STARTING HOUR = ";G
1090 INPUT "NEXT MINUTE = ";F
1100 C = 0
1110 INPUT "PRESS RETURN AT START OF MINUTE:";AS
1120 CALL - 936
1130 RETURN
  
```

## Original TRS-80 listing

```

2010 REM 5 CLS
2020 REM 10 G=1:F=0:C=0
2030 REM 20 C=C+.091
2040 REM 21 IF C>59 THEN F=F+1
2050 REM 22 IF C>59 THEN C=0
2060 REM 23 IF F>59 THEN G=C+1
2070 REM 24 IF F>59 THEN F=0
2080 REM 25 IF C>12 THEN G=1
2090 REM 26 PRINT @232,G;";"
2100 REM 27 PRINT @236,F;";"
2110 REM 30 PRINT @240,INT(C)
2120 REM 40 GOTO 20
2130 REM
2140 REM TO ADD TONE AT EACH HOUR
2150 REM
2160 REM 20 C=C+.099
2170 REM 31 IF F=0 AND C=0 THEN SOUND168,1
2180 REM
2190 REM TO ADD AN ALARM
2200 REM
2210 REM 20 C=C+.104
2220 REM 32 IF G=1 AND F=0 AND C=0 THEN SOUND168,100:C=C+7
2230 REM
2240 REM TO FIX TIME IF ADDING BOTH
2250 REM
2260 REM 20 C=C+.113
  
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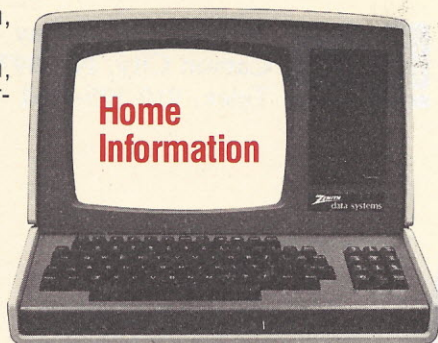


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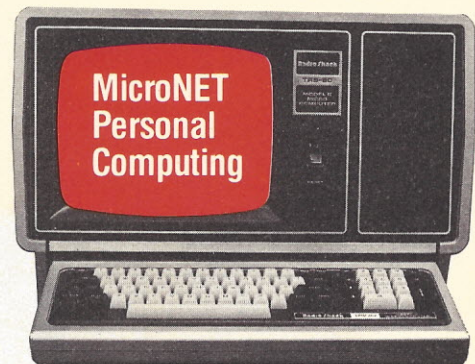
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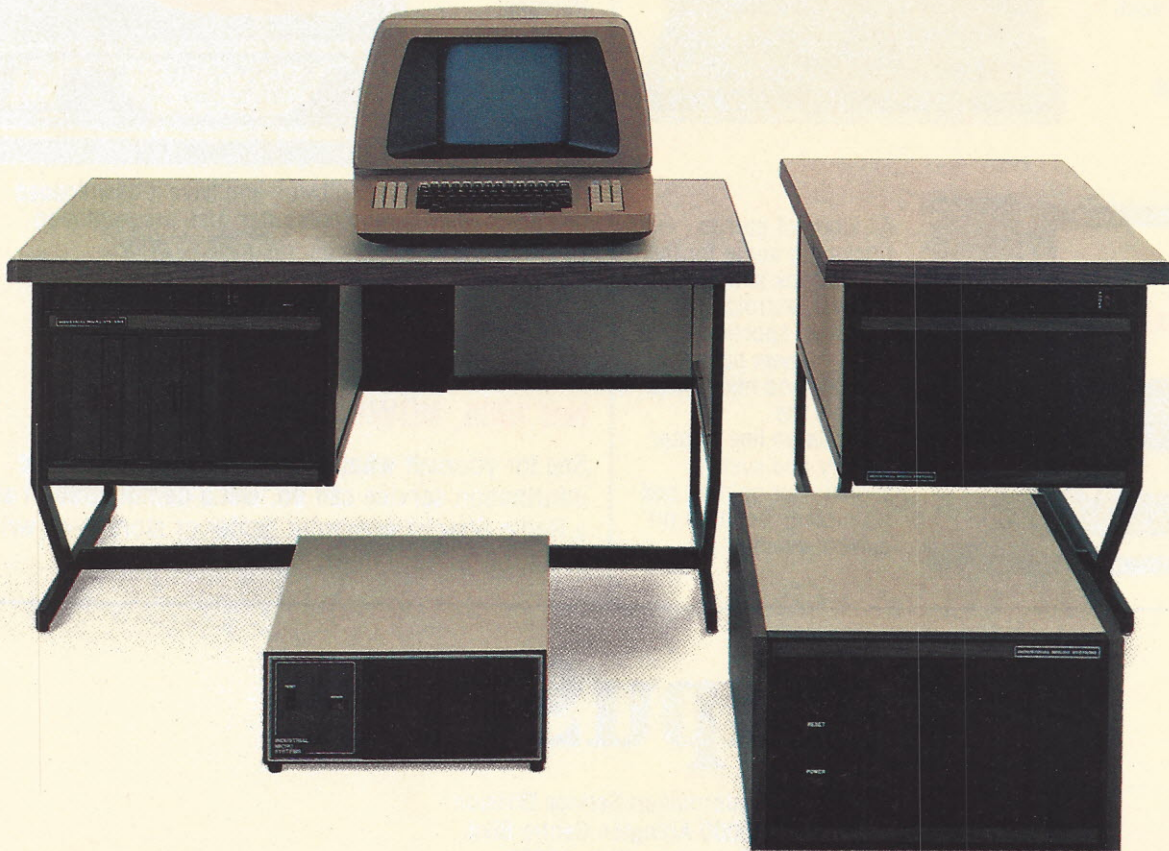
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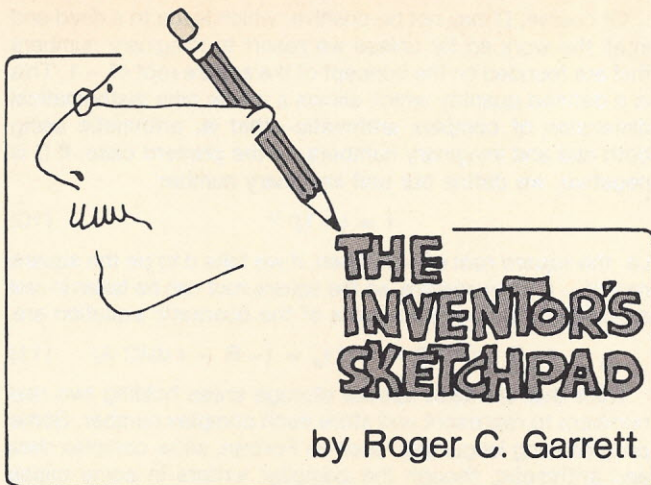
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### A Concept for the Mobility Impaired

I recently was having lunch at a restaurant when a woman entered in a wheelchair. It occurred to me that many people without the use of their legs substitute the strength and dexterity of their arms and hands, along with a wheeled chair, to maintain some level of mobility. That, on the surface, may not seem to be a very significant observation.

But, then I began to think about the various forms of research being done to provide more natural mobility to such individuals, i.e. the ability to walk. There are two basic approaches. One is concerned with utilizing artificial legs or external strap-on leg supports and either myoelectric (muscular) or neural signals from the natural leg or stump to control the artificial leg. The other approach deals with developing "intelligent" knees, in the case of those with only one incapacitated leg, to provide proper positioning of the leg as it "swings", moved by hip motion.

The significance of my observation then struck me. When this woman in her wheelchair was moving around, she used her hands and arms effectively in place of her legs. When she stopped at the table to have lunch or at the counter to pay her check, her hands resumed their normal function and the wheelchair became merely a chair. It occurred to me that it might be possible to use the hands as a controlling device for artificial legs since, when the person is moving around, the hands are already dedicated to the mobility function.

I envision a mechanical powered attachment to the existing biological legs, or artificial legs for amputees, which would provide the "strength" to move the legs. This would be

## I envision a mechanical powered attachment to the existing biological legs...

attached, via a microprocessor, to a hand-held control/feedback unit attached to a belt around the waist. When the person wanted to walk, she would place her hand (perhaps both hands) into the control unit. The motion of her hand, the wiggling of her fingers, the pressing of buttons, the flexing of her wrist, would be "translated" into the motion of the various joints of the artificial leg. Likewise, the positions and forces exerted on the legs would be fed back to the hand unit so that the user can "feel" the motion of the legs.

While the concept is simple, there are many technological problems to overcome. Oddly enough, the problems are mostly concerned with the powering of the artificial legs, the

batteries and motors. The control and feedback techniques should be relatively straightforward. What I find surprising is that, to the best of my knowledge, there is no ongoing research in this direction. I will continue to look into this concept. If anyone can offer any advice or guidelines, please drop me a note care of IA.

Over the years, I have introduced many concepts and ideas to aid the handicapped. Now it is your turn. Johns Hopkins University, in conjunction with The National Science Foundation and Radio Shack, is sponsoring a contest for personal computing to aid the handicapped. They are seeking out people involved in personal computing to discover new ideas, concepts, and applications of personal computing to aid the handicapped. There are three categories:

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# THE MICRO-MATHEMATICIAN

by Dr. John C. Nash

## Quadratic Equations: Computers fail high school maths

High school algebra textbooks seem very fond of quadratic equations. This may be because the authors enjoy subjecting a sizable proportion of the world's teenage population to a particular form of mental torture. But, it is more plausible that they recognize that quadratic equations and functions are ubiquitous elements of mathematics and its applications.

To set things in perspective, we begin with a review of the basic and not so basic formulas. A quadratic function of  $x$  is written:

$$f(x) = A x^2 + B x + C \quad (1)$$

where  $A$ ,  $B$ , and  $C$  are the coefficients of the power of  $x$  in the function, which is a second degree polynomial in  $x$ . The quadratic is a very special member of the general class of functions called polynomials; the general degree  $n$  polynomial in  $x$  has the form

$$p(x) = c_n x^n + c_{n-1} x^{n-1} + \dots + c_2 x^2 + c_1 x + c_0 \quad (2)$$

where the  $c_0$ ,  $c_1$ ,  $c_2$ , ...,  $c_n$  are the coefficients.

A quadratic equation arises when we set the quadratic function to zero.

$$f(x) = 0 = A x^2 + B x + C \quad (3)$$

In this case, we see that if  $A \neq 0$ , the quadratic equation can be rewritten.

$$x^2 + (B/A) x + (C/A) = 0 \quad (4)$$

Equations (3) and (4) have solutions or roots at values of  $x$  where the equations are satisfied. In fact, we can generate the quadratic function as a product of two linear (degree 1 polynomial) factors involving the two roots, which we shall label  $r_1$  and  $r_2$ . That is, we can work back from the roots to the function, which is given as follows.

$$f(x) = A(x - r_1)(x - r_2) \quad (5)$$

In the case of the general polynomial, we will have  $c_n$  times the product of factors involving all of the roots. However, finding the roots of polynomials is not easy except for degree 1 and degree 2, that is, linear and quadratic forms.

In the linear case, where (changing to  $g(x)$  because we change function)

$$g(x) = B x + C = 0 \quad (6)$$

we see immediately that the solution or root is simply at

$$x = -C/B \quad (7)$$

In the case of the quadratic equation (3) or (4), we turn to the time honored formula for  $r_1$  and  $r_2$ , which gives

$$r_1 = (-B + d)/(2 A), \quad r_2 = (-B - d)/(2 A) \quad (8)$$

where  $d$  is the positive square root of

$$D = B^2 - 4 A C = d^2 \quad (9)$$

Of course,  $D$  may not be positive, which leads to a dead end in all the work so far unless we resort to imaginary numbers that are founded on the concept of the square root of  $-1$ . This is a defined quantity which allows a whole new mathematical dimension of complex arithmetic—that is, arithmetic using both real and imaginary numbers. In the present case, if  $D$  is negative, we define our unit imaginary number

$$i = (-1)^{1/2} \quad (10)$$

i.e. the square root of  $-1$ . Then, if we take  $d$  to be the square root of  $-D$  (now positive, so the square root can be taken in real arithmetic), the complex roots of the quadratic equation are

$$r_1 = (-B + i d)/(2 A) \text{ and } r_2 = (-B - i d)/(2 A) \quad (11)$$

Note that we need special storage areas holding two real numbers to represent and store each complex number. Some programming languages, such as Fortran, allow complex data and arithmetic, though the compiler writers in some cases have not done their job very well and bugs have been reported in some of the functions and arithmetic operations. I prefer to code my own complex arithmetic where it is needed, since such numbers are often used more to keep the formulas general than to genuinely do something that cannot be done in the real domain.

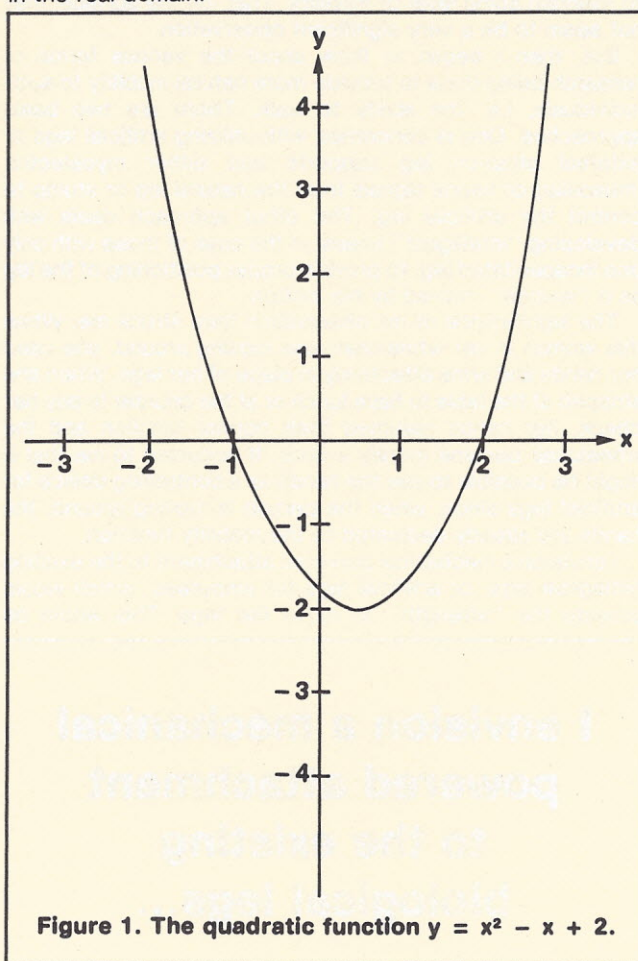


Figure 1. The quadratic function  $y = x^2 - x + 2$ .

Linear functions (degree 1 polynomials) can be graphed as straight lines. Quadratic functions are parabolas. Figure 1 shows the function

$$f(x) = y = x^2 - x + 2 \quad (12)$$

which has roots at  $-1$  and  $2$ . We need not say which is  $r_1$  and which is  $r_2$ , since the order is immaterial. The roots turn out to be where the function crosses the  $x$  axis. Other possibilities exist: the graph of the function just touches ("kisses") the axis, eg.

$$f(x) = y = -0.5x^2$$

(shown in figure 2), or the graph never touches the axis at all, eg.



$$f(x) = y = 2x^2 + 2$$

as shown in figure 3.

These cases correspond to the quadratic having two equal roots and complex roots respectively. Thus, the roots tell us something about the shape of the function and vice-versa.

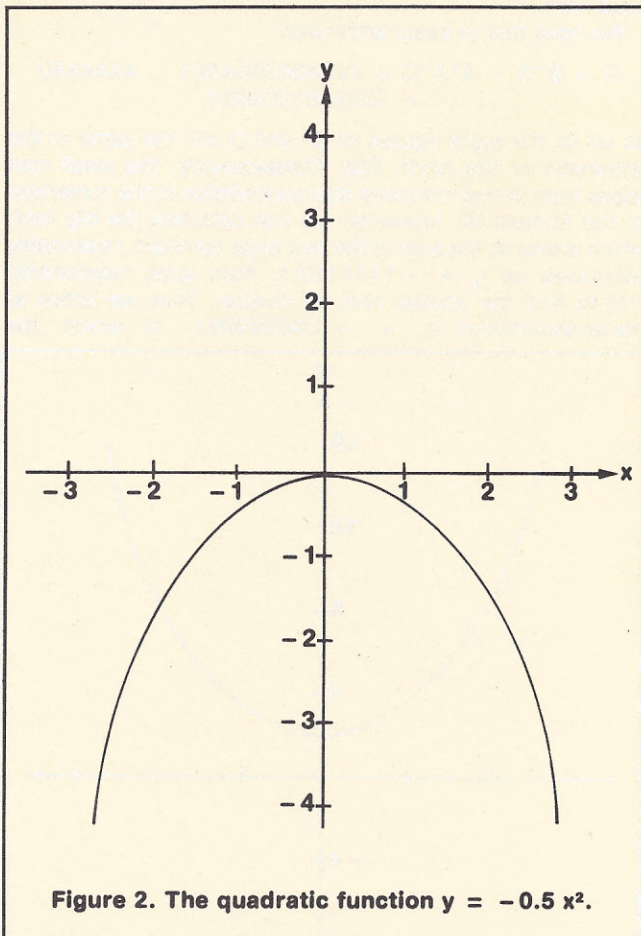


Figure 2. The quadratic function  $y = -0.5x^2$ .

We can also note a few other properties of the quadratic by actually multiplying out equation (5) to give

$$f(x) = Ax^2 - A(r_1 + r_2)x + Ar_1r_2 \quad (13)$$

Comparing the like powers of  $x$ , we have

$$r_1 + r_2 = (-B/A) \quad (14)$$

and

$$r_1r_2 = (C/A) \quad (15)$$

All of the above is a pleasant or unpleasant piece of algebraic manipulation, depending on your taste, and the formula (8) may seem an obvious solution to any quadratic equation problem that may arise. Indeed, they arise frequently, since quadratic functions—parabolas—are used to approximate many other functions that do not have such “nice” properties or whose properties we are not interested in. However, a straightforward implementation of the formula on a computer will lead to a very unsatisfactory program. In part, this is because not every set of three numbers  $A$ ,  $B$ ,  $C$  permits solutions to be computed; in part, we must watch out for rounding-errors that our calculation method induces and are unnecessary.

To write a satisfactory program, let's first state clearly what our objective is. Given any three real numbers  $A$ ,  $B$ ,  $C$ , correctly and accurately compute the one or two real roots of the function

$$Ax^2 + Bx + C$$

compute its two complex roots; or report on the impossibility of the calculation. An additional specification should be to verify the result by computing the quadratic function for the solution(s), if obtained.

Writing a program to carry out this objective involves the dual task of recognizing which case is presented and carefully calculating the desired answers. It is this double problem that causes most programs written to solve quadratic equations to fail what is really a fairly common high school mathematics problem. We can consider the following examples.

$A = 0, B = 1, C = 1$ : This is not a quadratic at all, but a linear function with the root at  $-1$ .

$A = -1, B = 0, C = -1$ : This reduces to  $x^2 = -1$ , so we have two roots, one at  $i$ , one at  $-i$ , where  $i$  is the square root of  $-1$ .

$A = 1, B = -2, C = 1$ : The formula gives two roots at  $+1$ .

$A = 1, B = 0, C = -1$ : Two roots at  $+1$  and  $-1$ .

$A = 1, B = -1000001, C = 1000000$ : The formula gives two roots at  $1000000$  and  $1$ .

$A = 0, B = 0, C = 1$ : Since  $1$  is not equal to  $0$ , this is impossible!

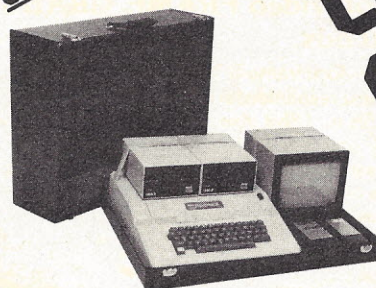
$A = 1, B = 1111111, C = 1111110$ : This has two roots at  $-1$  and  $-1111110$ . However, it is almost at linear equation, since it can “almost” be written  $1111110 * (x + 1) = 0$ .

$A = 1E-3, B = 1E5, C = 1E4$ : This has two roots near  $1E+8$  and  $0$ . The wide difference in range is a difficulty when calculations are performed in finite length arithmetic.

One of the main troubles that arises with the formula (8) is well demonstrated by the last two examples. Blindly applying the formula to  $A = 1, B = 1111111, C = 1111110$  on a North Star Horizon (8 digit Basic) gives two roots,  $r_1 = -0.95, r_2 = -1111110.1$ . When these are substituted into the quadratic function (1), we calculate (via  $(A*x + B)*x + C$ —Horner's Scheme for evaluating a polynomial) values  $f(-0.95) = 55555.4$  and  $f(-1111110.1) = 111110.91$ .

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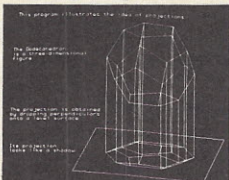
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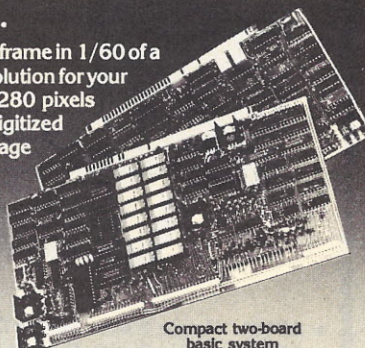
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The culprit, in the case of the smaller root at least, is digit cancellation arising from the sum/difference in the formula. There is not a great deal we can do about the accuracy of the big root, which comes about as the sum of two large numbers. But we can examine the calculation to improve the small root.

We note that in exact arithmetic

$$D = B^2 - 4AC = 1234567654321 - 4444440 \\ = 1234561209881$$

so six of the eight figures of  $B^2$  and  $D$  are the same in the arithmetic of the North Star. Consequently, the small root arises from almost complete digit cancellation in the numerator of the formula (8). However, we can calculate the big root, which arises as the sum of the two large numbers, reasonably accurately as  $r_2 = -1111110.1$ , then apply relationship (15) to find the smaller root by division. Now we arrive at the approximation  $r_1 = -0.99999991$ , at which the

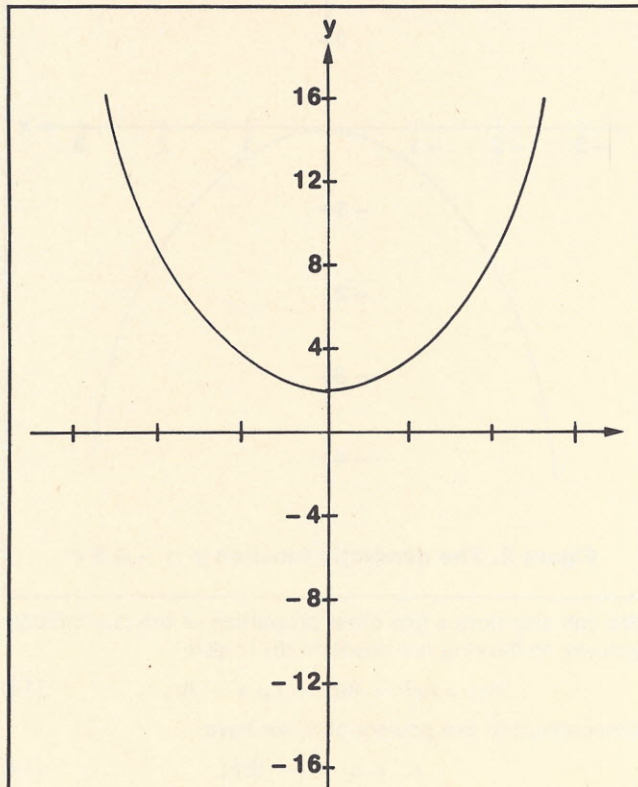


Figure 3. The quadratic function  $y = 2x^2 + 2$ . Note the different scale on the y-axis from figures 1 and 2.

quadratic function has the value  $f(r_1) = 0.1$  as computed by the North Star.

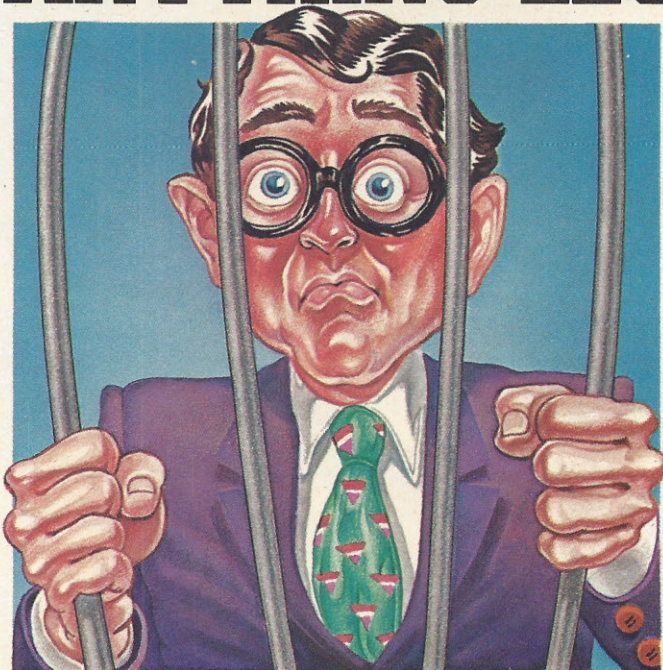
This strategy of finding the big root first and calculating the small one by division using equation (15) is a reasonable and reliable approach to the solution of quadratic equations. We still need to watch out for complex roots, and here there is little we can do to avoid the formula and its difficulties, such as digit cancellation when  $B^2$  and  $4AC$  are nearly equal in value.

One further step that can be taken, nevertheless, is a verification of the roots by substitution into the quadratic function. We have already seen how large roots may give a value for the quadratic function at a supposed root which is very different from zero. The program presented in listing 1 takes advantage of this deviation in the real root case to try to improve the approximation to the root by application of Newton's iteration. This could also be applied in the complex case. Listing 2 gives the results of applying the program to the examples already presented. Note that this program is designed to demonstrate the ideas in the column, so it contains a lot of extra code to calculate various information that would be left out of a production subroutine to solve quadratic equations. □



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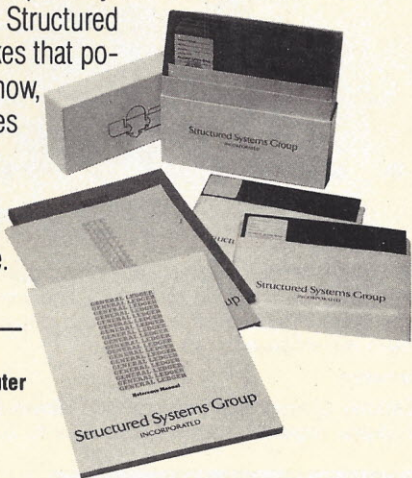
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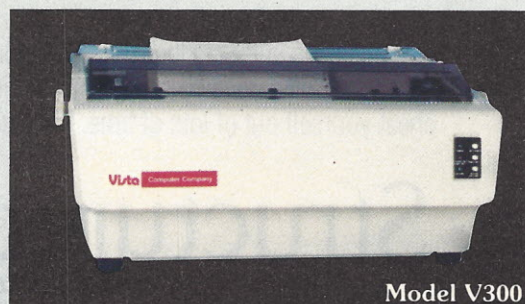
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## Listing 1

```

10 PRINT "QUAD FEB 14 81"
20 PRINT "AUTHOR: J C NASH"
30 PRINT
40 PRINT "PROGRAM FINDS ROOTS OF A QUADRATIC EQUATION"
50 PRINT "F(X) = AXX + BXX + C = 0"
60 PRINT "ENTER A,B,C -- ALL ZERO STOPS PROGRAM"
70 INPUT "A=";A
80 INPUT "B=";B
90 INPUT "C=";C
100 REM NEWTON ITERATION
110 IF A=0 THEN 230
120 IF B=0 THEN 170
130 REM EITHER PROBLEM IS IMPOSSIBLE OR WE MUST STOP
140 IF C=0 THEN STOP
150 PRINT "IMPOSSIBLE PROBLEM --- 'C,' < 0"
160 GOTO 30
170 REM 1 ROOT
180 LET R1=-C/B
190 PRINT "ONE ROOT ONLY AT X=",R1
200 LET X=R1
210 GOSUB 690 REM VERIFY RESULT
220 GOTO 30
230 LET D2=B*B-4*A*C
240 PRINT "DISCRIMINANT=",D2
250 REM CHECK FOR COMPLEX ROOT
260 IF D2<0 THEN 500
270 LET D=SQRT(D2)
280 PRINT "SQRT(DISCIMINANT)=",D
290 GOSUB 850 REM LOOK AT FORMULA
300 RESULTS
310 IF B>0 THEN 340
320 REM B NEGATIVE, SO TAKE POSITIVE SUM
330 LET R1=0.5*(-B+D)/A
340 GOTO 360
350 LET R1=0.5*(-B-D)/A
360 REM B POSITIVE SO NEGATIVE SUM IS BIGGER
370 REM GET SMALLER ROOT BY SOLVING R1*R2=C/A
380 LET R2=C/(R1*A)
390 PRINT "BIG ROOT AT X=",R1, " 'SMALL' ROOT AT X=",R2
400 LET X=R1
410 LET I9=0
420 PRINT "VERIFICATION ",
430 GOSUB 690
440 IF I9>0 THEN PRINT "NOTE NEW ROOT APPROXIMATION"
450 LET X=R2
460 LET I9=0
470 PRINT "VERIFICATION "
480 GOSUB 690
490 IF I9>0 THEN PRINT "NOTE NEW ROOT APPROXIMATION"
500 GOTO 30
510 REM COMPLEX ROOT
520 LET D=SQRT(-D2)
530 PRINT "SQRT(-DISCRIMINANT)=",D
540 LET R1=-0.5*B/A
550 LET R2=0.5*D/A
560 PRINT "COMPLEX ROOTS AT"
570 PRINT "X=",R1," + ("R2,")*SQRT(-1)"
580 PRINT "X=",R1," + ("R2,")*SQRT(-1)"
590 REM VERIFY RESULTS
600 GOSUB 630
610 LET R2=-R2
620 GOSUB 630
630 GOTO 30
640 REM COMPLEX VERIFICATION
650 D=A*(R1*R1-R2*R2)+B*R1+C
660 D2=2*A*R1*R2+B*R2
670 PRINT "VERIFICATION AT X=",R1,"+SQRT(-1)*("R2,")"
680 PRINT "F(X)=",D,"+SQRT(-1)*("D2,")"
690 RETURN
700 REM VERIFICATION
710 LET D1=1E35 REM LAST DEVIATION
720 D2=(A*X+B)*X+C
730 PRINT "AT X=",X, " F(X)=",D2
740 IF I9<0 THEN RETURN
750 IF D2=0 THEN RETURN
760 IF ABS(D2)>=ABS(D1) THEN 820
770 LET I9=I9+1
780 LET D1=D2
790 PRINT "TRY "
800 REM UPDATE USING NEWTON FORMULA
810 LET X=X-D2/(2*A*X+B)
820 GOTO 710
830 PRINT "ITERATION DIVERGING"
840 RETURN
850 PRINT "2 ROOTS BY FORMULA"
860 LET X=0.5*(-B+D)/A
870 GOSUB 710
880 LET X=0.5*(-B-D)/A
890 GOSUB 710
900 PRINT "*****"
910 RETURN
920 END

```

## Listing 2

```

LOAD QUAD
READY
RUN
QUAD FEB 14 81
AUTHOR: J C NASH
PROGRAM FINDS ROOTS OF A QUADRATIC EQUATION
F(X) = AXX + BXX + C = 0

```

```

ENTER A,B,C -- ALL ZERO STOPS PROGRAM
A=0 B=1 C=1
ONE ROOT ONLY AT X= -1
AT X= -1 F(X)= 0

```

```

PROGRAM FINDS ROOTS OF A QUADRATIC EQUATION
F(X) = AXX + BXX + C = 0
ENTER A,B,C -- ALL ZERO STOPS PROGRAM
A=-1 B=0 C=-1
DISCRIMINANT= -4
SQRT(DISCIMINANT)= 2
COMPLEX ROOTS AT
X= 0 + (-1)*SQRT(-1)
X= 0 + (1)*SQRT(-1)
VERIFICATION AT X= 0+SQRT(-1)*(-1)
F(X)= 0+SQRT(-1)*(-1)
VERIFICATION AT X= 0+SQRT(-1)*(1)
F(X)= 0+SQRT(-1)*(1)

```

```

PROGRAM FINDS ROOTS OF A QUADRATIC EQUATION
F(X) = AXX + BXX + C = 0
ENTER A,B,C -- ALL ZERO STOPS PROGRAM
A=1 B=-2 C=1
DISCRIMINANT= 0
SQRT(DISCIMINANT)= 0
2 ROOTS BY FORMULA
AT X= 1 F(X)= 0
AT X= 1 F(X)= 0
*****
'BIG' ROOT AT X= 1 'SMALL' ROOT AT X= 1
VERIFICATION AT X= 1 F(X)= 0
VERIFICATION AT X= 1 F(X)= 0

```

```

PROGRAM FINDS ROOTS OF A QUADRATIC EQUATION
F(X) = AXX + BXX + C = 0
ENTER A,B,C -- ALL ZERO STOPS PROGRAM
A=1 B=0 C=-1
DISCRIMINANT= 4
SQRT(DISCIMINANT)= 2
2 ROOTS BY FORMULA
AT X= 1 F(X)= 0
AT X= -1 F(X)= 0
*****
'BIG' ROOT AT X= -1 'SMALL' ROOT AT X= 1
VERIFICATION AT X= -1 F(X)= 0
VERIFICATION AT X= 1 F(X)= 0

```

```

PROGRAM FINDS ROOTS OF A QUADRATIC EQUATION
F(X) = AXX + BXX + C = 0
ENTER A,B,C -- ALL ZERO STOPS PROGRAM
A=1 B=-1000001 C=1000000
DISCRIMINANT= 9.999998E+11
SQRT(DISCIMINANT)= 999999
2 ROOTS BY FORMULA
AT X= 1000000 F(X)= 0
AT X= 1 F(X)= 0
*****
'BIG' ROOT AT X= 1000000 'SMALL' ROOT AT X= 1
VERIFICATION AT X= 1000000 F(X)= 0
VERIFICATION AT X= 1 F(X)= 0

```

```

PROGRAM FINDS ROOTS OF A QUADRATIC EQUATION
F(X) = AXX + BXX + C = 0
ENTER A,B,C -- ALL ZERO STOPS PROGRAM
A=0 B=0 C=1
IMPOSSIBLE PROBLEM --- 1 < 0

```

```

PROGRAM FINDS ROOTS OF A QUADRATIC EQUATION
F(X) = AXX + BXX + C = 0
ENTER A,B,C -- ALL ZERO STOPS PROGRAM
A=1 B=1111111 C=1111110
DISCRIMINANT= 1.2345633E+12
SQRT(DISCIMINANT)= 1111109.1
2 ROOTS BY FORMULA
AT X= -.95 F(X)= 55555.4
AT X= -111110.1 F(X)= 111110.91
*****
'BIG' ROOT AT X= -111110.1 'SMALL' ROOT AT X= -.99999991
VERIFICATION AT X= -111110.1 F(X)= 111110.91
TRY AT X= -111110 F(X)= 0
NOTE NEW ROOT APPROXIMATION
VERIFICATION AT X= -.99999991 F(X)= .1
TRY AT X= -1 F(X)= 0
NOTE NEW ROOT APPROXIMATION

```

```

PROGRAM FINDS ROOTS OF A QUADRATIC EQUATION
F(X) = AXX + BXX + C = 0
ENTER A,B,C -- ALL ZERO STOPS PROGRAM
A=1E-3 B=1E5 C=1E4
DISCRIMINANT= 1E+10
SQRT(DISCIMINANT)= 100000
2 ROOTS BY FORMULA
AT X= 0 F(X)= 10000
AT X= -1E+08 F(X)= 10000
*****
'BIG' ROOT AT X= -1E+08 'SMALL' ROOT AT X= -.1
VERIFICATION AT X= -1E+08 F(X)= 10000
TRY AT X= -1E+08 F(X)= 10000
ITERATION DIVERGING
VERIFICATION AT X= -.1 F(X)= 0

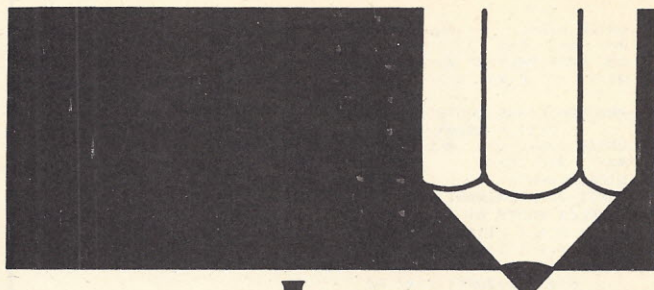
```

```

PROGRAM FINDS ROOTS OF A QUADRATIC EQUATION
F(X) = AXX + BXX + C = 0
ENTER A,B,C -- ALL ZERO STOPS PROGRAM
A=0 B=0 C=0
STOP IN LINE 150
READY

```





# Learning with Micros

by Louis E. Frenzel

## Educational Computing Publications

When I started writing this column last year, there was very little editorial coverage of computers in education. Aside from an occasional article in popular micro magazines, there were few places to go for information on the emerging computer/education movement.

This need is now being met by many publications. A number of established educational publications have increased their coverage of microcomputers. And several new magazines have been established. Some are dedicated to the computer/education field, while others cover the broader field of educational technology. Following is a run-down of some noteworthy publications addressing this field.

*Computer Classroom News*  
P.O. Box 266  
Cambridge, MA 02138

This bimonthly newsprint tabloid covers all aspects of microcomputing in schools. The first issue was dated Sept./Oct., 1980.

*Computer Time*  
Robert Stuart Junior High School  
Caswell Ave. W.  
Twin Falls, ID 83301

This is a newsletter that covers the subject of computer programming in the schools. It publishes six issues per year.

*Computing Teacher*  
Computing Center  
Eastern Oregon State College  
La Grande, OR 97850

This periodical is a professional journal for educators interested in the instructional uses of computers (and calculators). The emphasis is pre-college.

*Courseware Magazine*  
4919 N. Millbrook #222  
Fresno, CA 93726

This is not a magazine as we ordinarily think of one, with articles, ads, editorials and the like. Instead, it is a periodic source of educational programs for home, elementary and secondary school use. The "magazine" consists of a C10 cassette containing the programs and the supporting documentation, which includes a teacher's guide, student worksheets, objectives, suggestions for use, an abstract and a complete listing. Versions of the magazine are available for Apple II, Pet and TRS-80. It is published five times per year.

*Educational Electronics*  
One Lincoln Plaza  
New York, NY 10023

This monthly newsletter deals with the application of electronics technology to instruction. It covers topics such as

computer hardware and software, speech synthesis and recognition, A/V equipment and video.

*Educational Technology*  
140 Sylvan Ave.  
Englewood Cliffs, NJ 07632

This publication has been around for many years. It covers the broad field of educational technology including A/V, video, programmed instruction (PI), self-paced learning, competency-based education and the like. Computer coverage has increased significantly over the years.

*Electronic Learning*  
Scholastic Inc.  
50 W. 44th St.  
New York, NY 10036

This publication will debut this fall (Sept./Oct.). To be published bimonthly, it is aimed at elementary and secondary school educators. The magazine will cover microcomputer hardware and software, video tape and disk and other electronic teaching equipment, as well as related topics such as funding, purchasing and applications.

*Instructional Innovator*  
1126 Sixteenth St., N.W.  
Washington, D.C. 20036

This is the main publication of the Association for Educational Communications and Technology. It is published monthly nine times a year. A subscription comes with membership. AECT also publishes two quarterlies, the *Journal of Instructional Development* and the *Educational Communications and Technology Journal*, both available through membership. AECT is an organization of professionals in schools and industry concerned with the improvement of instruction through the effective use of media and technology. Computers are regularly covered.

*Performance & Instruction*  
1126 Sixteenth St., N.W., Suite 315  
Washington, D.C. 20036

This is the official membership publication of the National Society for Performance and Instruction. NSPI is an organization of academic and industry educators who study and use advanced educational techniques. Subjects like PI and CAI have been the central focus of the organization.

*Perspectives in Computing*  
International Business Machines Corp.  
Old Orchard Rd.  
Armonk, NY 10504

This IBM quarterly examines the application of computers to academic disciplines. A complementary subscription is available to university personnel.

*T.H.E. Journal*  
P.O. Box 992  
Acton, MA 01720

This is one of the oldest magazines covering computers in education. It has been published since the mid-'70s and takes a broad look at the field of educational technology. T.H.E. stands for Technical Horizons in Education. In addition to fairly regular computer coverage, it also covers advances in audio/visual (A/V) equipment and techniques, learning by video tape and disk, and other technological developments affecting education. The magazine is published six times per year.

It is encouraging to see this growing awareness of the need for reading sources on this vital topic. It is our hope that the trend continues to flourish. □

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# BUSINESS SOFTWARE REVIEW

By Carl Heintz, CPA

## Memorite III and Execuplan Packages

Usually this column avoids reviewing software that is restricted to one manufacturer's machine. However, a piece of software is occasionally so outstanding as to merit special attention. Such is the case with Vector Graphic's new word processor Memorite III and its companion business planning program Execuplan. A microcomputer is only as good as the applications programs that run on it—in this case, the software may serve as reason enough to purchase the computer.

### The Memorite package

Nothing can compete with a software program tailored to one particular machine. All features can be utilized to their fullest extent and any disadvantages of the machine worked around. Vector Graphic designed the Memorite system with

similarities to the Electric Pencil software, but tailored especially for its products: the Vector MZ, 2800, 3005, VIP and other computer systems. All products share the same Z80 processor and memory mapped terminal configuration, which allowed the designers to take full advantage of the machine's power. The programs are mostly written in assembly language, although there are extensions of the system that utilize MBasic. The CP/M operating system is used.

The system is designed for even the most inexperienced user to get up and running. The only tricky part is knowing how to Sysgen the disk supplied and make a backup copy of it. Assuming the user can get dealer help in this, the rest of the system is so easy to assimilate that a totally inexperienced person can master it quickly.

The secret to this is the manual. It was written by a non-computer person with the average office worker in mind. It is organized with nine sections, a total of 85 short little "lessons" with two or three commands taught in each one. It is easy to read, with numbered steps and comments about what should be happening at each step.

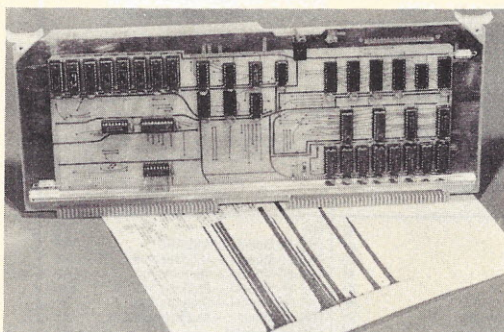
It is organized in three levels—beginning, intermediate and advanced. Within each level, the operator is given instruction on the basics of entering, formatting, editing and printing text, and the latter two sections include details on storing texts and file handling.

The system includes a number of features that set it apart from other word processing systems. Included is the ability to overstrike to create bold print, underlining, programming that allows the printing in both directions, full support of proportional spacing, vertical spacing that allows standard or non-standard formats (example: one can double space or one-and-one-half line space). The printer can even double underline. In addition, the system can reproduce ascenders or descenders (such as a ' to indicate a footnote). Headings and footnotes can also be included.

Printing columns of numeric data is often a tricky procedure with a word processing system due to the left-hand nature of tabs. Memorite includes a system for numeric justification within columns, thus allowing the operator to enter columns of numbers, such as in an income statement, and have them printed correctly.

The ASCII character set include certain characters that do not appear on the typical terminal keyboard. Occasionally, a document could benefit by the inclusion of some of these special characters, such as a vertical bar, a back quote, a back

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**Nothing can compete  
with a software program  
tailored to  
one particular machine.**

slash, or tilde. The system allows a user to access to these special characters in a simple, direct and workable fashion.

One area that occasionally causes problems, especially when small margins are used and the text contains large words, is hyphenation. Most software does not contain any provision to allow the user to suggest hyphenation spots. The Memorite system allows the user to include them within the body of the text. This improves the look of copy if the user implements it whenever it appears that the text contains a lot of long words, or the margins are narrow. Additionally, the user can specify that certain phrases are not to be broken up between lines.



Numbering pages is a standard feature of most word processing systems. Very few allow the user to modify the numbering sequence in the middle of the text. Memorite does. Thus, text can be conformed to proper pagination if, for example, there is an illustration that will be inserted in the finished product.

The hardware includes an automatic sheet feeder that may be attached to the Qume printers offered as part of the Vector system. Memorite contains commands that allow the user to enable and disable the sheet feeder through software command.

A good word processor includes provisions for appending files from disk to the text currently in memory, and allows for the insertion of text at various positions. Memorite allows

## One area that occasionally causes problems—is hyphenation

both functions, performed by the operator with simple one and two keystroke commands.

Much of the power of a word processing system depends upon the ability to search and replace words and phrases with alternatives. Vector's software allows global or restricted searches and replacements, searches with "wild cards" (ie sc?? finds "scan" and "scat") and searches for a limited number of times.

The newest addition to word processing systems is a spelling program that will scan the text and identify words that do not match the program's internal spelling dictionary.

Memorite includes a 30,000 word spelling dictionary that can be invoked after text has been entered and stored on disk. The program scans each line of text and pauses on each word that it can't identify. The operator can then either accept or modify the word. Once accepted, the program will accept all subsequent identical spellings of the word. Thus, in a technical paper that makes frequent use of the same, unusual words, only the program's first encounter with the unusual word will be questioned.

### Strong in documentation management

Most documents have information about them which just isn't in the document itself and needs to be maintained someplace. This information includes the author of the document, date created, date last modified, comments about the document, and perhaps something about who should and who shouldn't see it. Memorite has extensive capabilities in the document management area, including a label attached to each text file identifying all of the information above. Further, the system has provisions for passwords to preclude unauthorized access to sensitive documents. Further, the system even allows the user to access the previous version. (Automatic backup is standard on all files.)

The system supports multiple disk drives and also has all capabilities for hard disk time-share and multi-user systems, which may be implemented easily to form unique and very powerful information processing systems.

No respectable word processing system is complete without some provisions for a mailing list program. Many systems are sparse when it comes to features in the mailing list. This mailing list system is as good as any stand-alone system, with some features not found in other commercially available systems.

Maintaining a mailing list is essentially a data base function. Memorite includes a mini-data base that allows for the standard functions, but also allows the user to create custom designed

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This comprehensive Diskette Cataloging/Indexing utility allows the user to keep track of thousands of programs in a categorized library. Machine language program works with all TRSDOS and NEWDOS versions. Files include program names and extensions, program length, diskette numbers, front and back, and diskette free space.

### ★★NEW★★

**KFS-80 (1-drive 32K Min — Mod II 64K)**

Mod I, III \$100.00; Mod II \$175.00

The keyed file system provides keyed and sequential access to multiple files. Provides the programmer with a powerful disk handling facility for development of data base applications. Binary tree index system provides rapid access to file records.

### ★★NEW★★

**MAILLIST (1-drive 32K Min - Mod II 64K)**

Mod I, III \$75.00; Mod II \$150.00

This ISAM-based maillist minimizes disk access times. Four keys — no separate sorting. Supports 9-digit zip code and 3-digit state code. Up to 30 attributes. Mask and query selection. Record access times under 4 seconds!!

### ★★NEW★★ LPSPPOOL (32K 1-drive Min)

Mod I \$75.00

LPSPPOOL — Add multi-tasking to permit concurrent printing while running your application program. The spooler and despooler obtain print jobs from queues maintained by the system as print files are generated. LPSPPOOL supports both parallel and serial printers.

### UTILITY PACKAGE (Mod II 64K)

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Important enhancements to the Mod II. The file recovery capabilities alone will pay for the package in even one application! Fully documented in 124 page manual! XHIT, XGAT, XCOPY and SUPERZAP are used to reconstruct or recover data from bad diskettes! XCOPY provides multi-file copies, 'Wild-card' mask select, absolute sector mode and other features. SUPERZAP allows examine/change any sector on diskette include track-0, and absolute disk backup/copy with I/O recovery. DCS builds consolidated directories from multiple diskettes into a single display or listing sorted by disk name or file name plus more. Change Disk ID with DISKID. XCREATE preallocates files and sets 'LOF' to end to speed disk accesses. DEBUGII adds single step, trace, subroutine calling, program looping, dynamic disassembly and more!!

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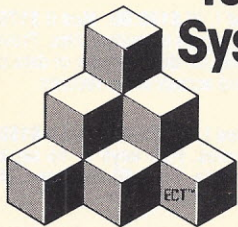
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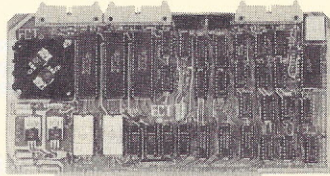
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reports. The system is configured to accept information for names (2 lines worth, so that titles may be included), addresses, and 9 digit zip codes. Additional information includes telephone number and a special field for salutations (such as a nickname).

One of the most important fields is a "qualifier" that may be up to 40 characters long. The Memorite system uses this field for sorting the names and addresses and as the basis for selection or exclusion of the data item. One missing feature as a result of only having one key field is, sorting by zip code, which is necessary in bulk mail. For this, the operator will have to enter the zip code twice, once in the zip code field, and again in the qualifier field. The user can enter up to 40 characters in the qualifier field. For example, it would be possible to enter the zip code and additional qualifiers, such as the business type, etc. of the data item.

Up to 32,764 names may be on the mailing list in any one file. However, the sort and select program will only accept 3,700 for sorting, so for practical purposes this is the upper limit for the mailing list system. Of course, the user can have multiple files, each with up to 3,700 names, but these separate lists cannot be sorted simultaneously.

The mailing list program is set up to print labels, lists, or be merged into the Memorite system to print letters or other documents.

There may be better word processing systems on the market than Memorite, but I have yet to see one. The only users who will have some needs that Memorite cannot fulfill are writers of books. Memorite has no features for automatic indexing and table-of-contents, nor does it provide for chapters and pagination by chapters.

### Execuplan

This is a series of programs that give the user an interactive electronic worksheet to produce numeric models of accounting and financial data. Businessmen typically use such models to produce forecasts, budgets, projections, amortization and depreciation tables, error analyses, and statistical calculations.

The programs basically allow the user to specify a worksheet format, complete with columns and rows. Each column and row is given a name. Then the user defines what goes where. For example, each column might be defined as a month in the year. Each row might be defined as an operating cost for the business. The first column might represent the current month's data. Then, for each row (expense item) for every successive month (column) the computer would be given instructions on how to calculate the amount to be placed there. This could be different for each row. One row might be calculated based upon the results of other rows, such as a percentage of another row. Certain rows might be percentages of the prior months' figures, and so forth. The possibilities are endless.

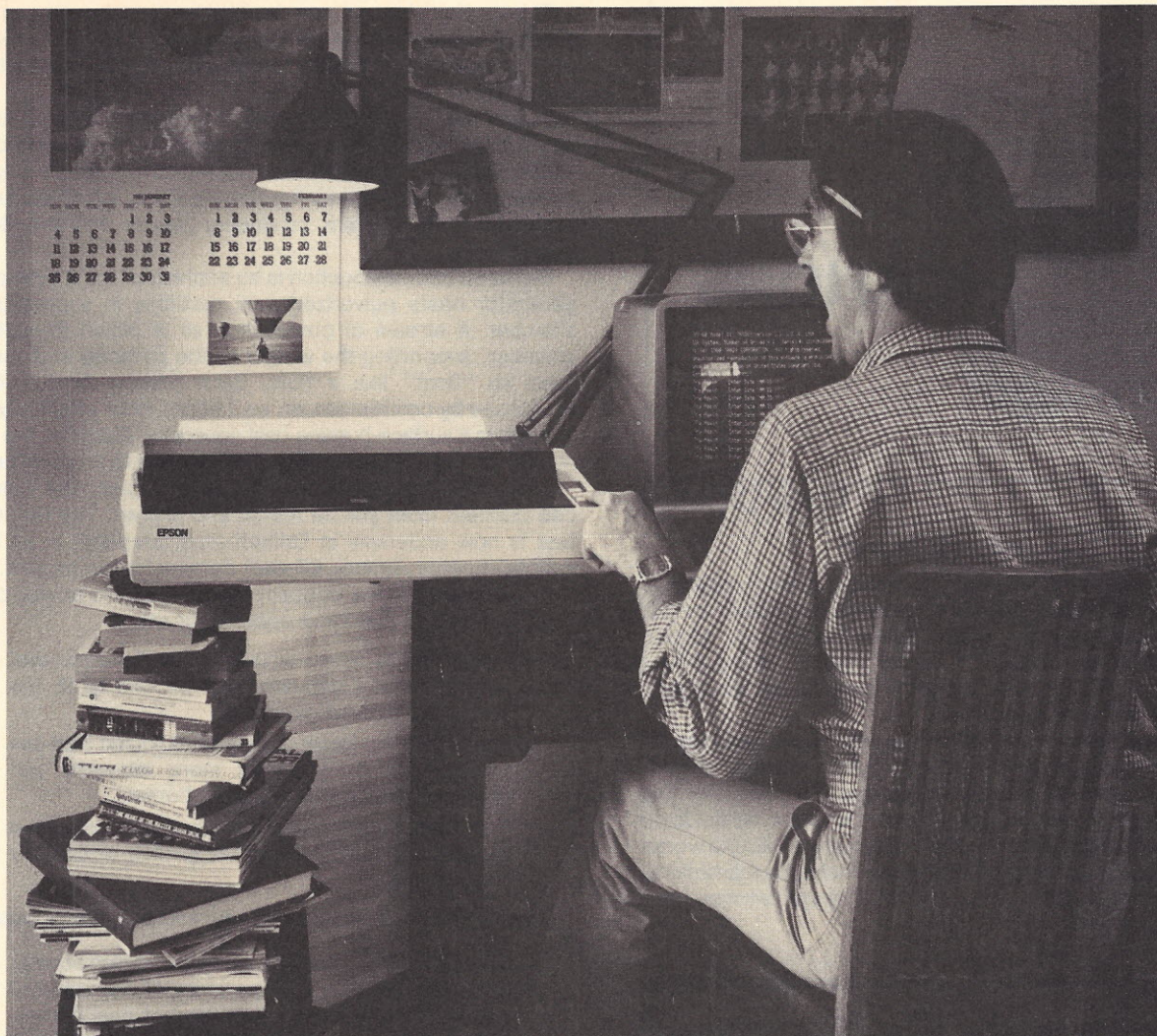
Once the model is created, the user can modify it, run it and view the results. Fine-tuning of the model can be accomplished until it adequately reflects the data and results. Then, the model may be saved, run on the screen, or printed. The model itself may be very simple or extremely complex. The model allows for all typical algebraic calculations and includes trigonometric functions, logarithms (natural and decimal), exponentiation, summation, min-max, average and means, variance and standard deviation, net present value, square roots, absolute value and a counter to record the number of items (used in statistics, for example).

The system is extremely flexible, very powerful, and easy to use. Since it is written in assembly language, it runs fast. The manual is simple and direct, although not as simple as the Memorite manual. It is complete and directed at users who have a very basic understanding of the computer.

These two packages represent the kind of software that is necessary for a successful implementation of the electronic office. □

JULY 1981





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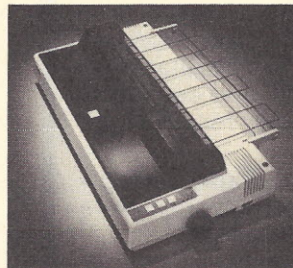
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Needless to say, the specs on this machine — and especially at under \$1000 — are practically unbelievable. But there's something about the MX-100 that goes far

beyond just the specs; something about the way it all comes together, the attention to detail, the fit, the feel. Mere words fail us. But when you see an MX-100, you'll know what we mean.

All in all, the MX-100 is the most remarkable printer we've ever built. Which creates rather a large problem for those of us at Epson.

How are we going to top this?



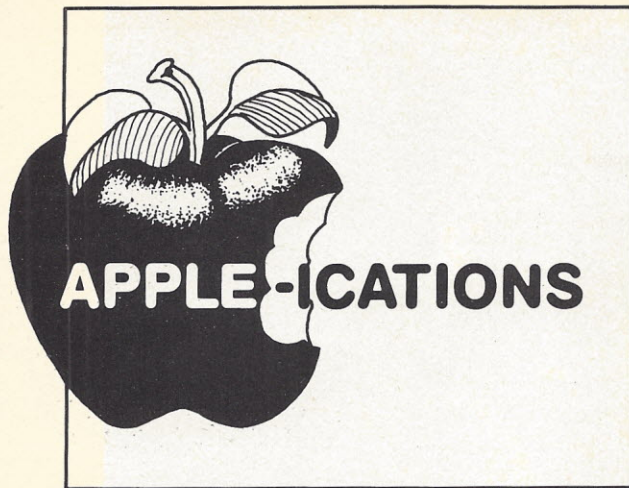
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by Tony Dirksen

### An Apple for Energy

What's in a name? In the politics of energy, maybe everything. During recent years, the most talked-about elixirs for our energy afflictions have been characterized by simple, suggestive names. "Solar", "wind", even "nuclear"—a name that conjures for some a Buck Rogers future, for others, an image of the final holocaust.

Yet one less glamorous energy alternative has gone almost completely unnoticed by the general public, perhaps at least partly because of its intimidating name. It's tough for the average person to get excited about a "pressurized fluidized bed combustion generator"—the name makes it sound worse than anything it might replace. But many, including the National Academy of Sciences, think it may offer great promise for a clean energy future.

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### DATASMITH

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This is the story of one facility that's using that energy alternative despite its intimidating name. And how a computer with a somewhat friendlier name—the Apple—came to be part of it.

In a sense, the fluidized bed represents the next logical stage in the evolution of power production. First came direct water power. Then water was heated to run steam engines and turbines. Now comes the fluidized bed, which eliminates the water in the system, producing gasses that directly run gas turbines.

Fluidized bed combustion is so sophisticated, it's simple. A generator heats pulverized coal particles in a pressurized chamber. A stream of combustion air is blown through the chamber, supporting the weight of the particles and causing them to "float" like a fluid. Each particle is completely enveloped by combustion air, so it burns more efficiently than it would in a surface-burning coal generator. Gas from the combustion of these particles operates a turbine to produce power.

Like most alternative energy technologies, the fluidized bed concept must still be tested and proven. The first major test is now underway in Grimethorpe, England, in an International Energy Agency 65-watt demonstration project.

If the fluidized bed concept works, electric power plants may cost less to build and operate, because:

- Power plants can be smaller, since a pressurized fluidized bed combustor can be one-tenth the size of a standard generator.
- Fuel costs are lower, since the fluidized bed can produce up to one-third more kilowatts per pound of coal than a standard burner.
- Fuel supplies are virtually guaranteed, because a fluidized bed can burn lower grades of coal, or even garbage.

And fluidized bed plants will produce less pollution, because:

- Nitrogen oxide emissions are reduced significantly, since the 1600° F. temperature of the fluidized bed is about half that of a standard coal burner.
- Sulphur emissions are lower, since limestone is added to the fluidized bed to capture sulphur compounds and produce gypsum.

One of the hurdles to the development of fluidized bed combustion has been detecting fine particles in the gas duct that can clog and erode the turbine. Acurex, a Mountain View, CA company with a background in energy applications, took on the task for Grimethorpe.

### Particles gathered and tested

Acurex designed three identical probes to collect flyash samples at different locations in the duct and report on the changing size, distribution, and concentration of particles. A nozzle from each probe enters a side pipe in the duct, draws several samples, and weighs the particles in each sample. The concentration of particles in the duct is calculated by comparing the weight of the sample to the gas flow.

White-hot gas moves at hurricane velocities in the duct, requiring a precisely controlled sampling system. And since thermal expansion can change the duct dimensions by up to 2 inches, the 2500-pound probes must be precisely positioned. (They hang from enormous spring mountings to allow for adjustments.)

Three Apple II Plus computers (one for each probe) are used at Grimethorpe to position the probes in the gas duct and measure pressures, temperatures, and flow data. In addition, the computers remove a probe from the duct if sampling problems develop, and describe repair procedures for the operator to perform. Sampling takes place twice a day, leaving the computers free for process data analysis or related calculations when the probe is idle.

Each Grimethorpe system is a 48K Apple II Plus with floppy disk drive, video monitor, and Silentype printer. Four boards



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in the I/O slots control and time the probe. Two Hueristics Controller 70 cards (each with 4 relays) control the movement of the probe during sampling. An Interactive Structures AI-02 16-channel analog-to-digital converter board tells the computer what the probe has found. And a Mountain Hardware real-time Apple Clock is used to integrate and calculate gas volumes, time various sampling operations, and log the date and time on test summaries.

### Programs control probes

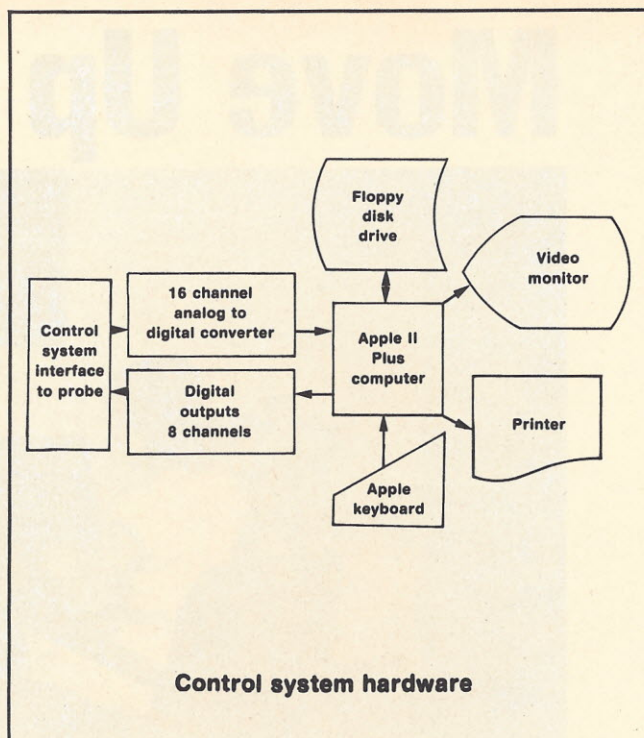
A series of six programs operate the Grimethorpe sampling probes. All programs are written in Applesoft Basic. Programmer Steve Chaump notes that: "As it is, we can perform an entire sampling loop in about one second. If we had faster data requirements, we probably would have used assembly-language or Pascal programs instead."

Although this was the first time Chaump had worked with a microcomputer Basic, he found it relatively easy to make the switch from Fortran programming. "I did have to make some adjustments," he says "like working around the two-character variable names. But nothing was insurmountable."

Two main programs control each probe during sampling. Four additional programs are used for set-up, calibration, and troubleshooting. During each sampling run, a controlling program positions the probe at up to 50 different duct positions, takes measurements of the pressures and temperatures in both the gas duct and the sampler, performs calculations on the measurements, and produces a hard copy of the data.

The other programs allow the operator to do such things as change the number or location of sampling points in the duct, or test the probe without making a full run of the system.

The Grimethorpe application may itself have spin-offs, notes Mike Shackleton of Acurex. "While these probes were designed specifically for the Grimethorpe operation, they can be adapted by simple design changes to collect process data in other high temperature, high pressure facilities such as



coal gasifiers and catalytic petroleum crackers." Acurex is currently working on a development program for hot gas filter devices: they've been using an Apple computer in their experimental designs.

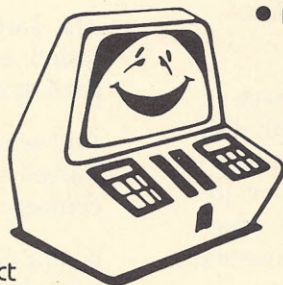
If the Grimethorpe facility proves successful, it may be that Apples will take an increasing role in fluidized bed power development. Now all we have to do is come up with a less intimidating name for it. How about Orange Power? □

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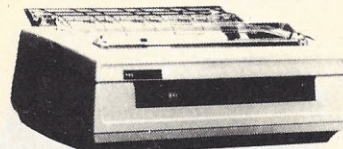
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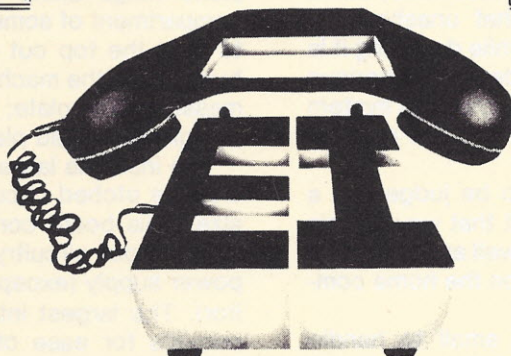
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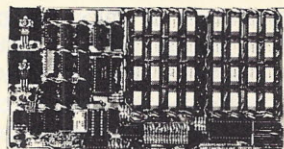
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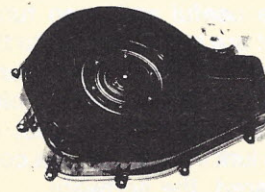
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## System of the Month



# Commodore CBM

by Tom Fox

The CBM by Commodore Business Machines, Santa Clara, CA is a computer system that unashamedly admits its home computer heritage, while declaring it is now grown up enough to be considered for serious work in a business environment. A study of this system is instructive, for it embodies both the best and the worst of this method of breeding.

By its very name, the unit asks to be judged as a business computer, so we will treat it that way. In this arena, it does not come off nearly so well as the Pet, its successful Commodore counterpart on the home computer front.

Is this because the CBM is too small to handle serious business work? No, for surely there are small computing tasks as well as large ones in most of today's businesses. The reason can be explained in two words: excess baggage. The CBM arrives at the business doorstep accompanied by a mound of features that were useful and even fun in the game room at home, but are inappropriate to the new environment. In the new surroundings, the features become unwelcome quirks that get in the way of doing the job at hand. The situation is disappointing, but correctable, since the problems lurk in that part of a computer that is the most easily altered: the software.

The CBM can be thought of as a Pet with peripherals. The main computer/terminal unit is the 2001 series professional computer. It is delivered in a package with a model 2040 dual drive floppy disk, 2022 series tractor printer, interconnecting cables, demonstration diskette and instruction manuals. The only addition needed to make it useful is suitable applications programming.

One of the company's strongest suits is the attention lavished on robust packaging of products. The main CBM computer/terminal unit is a good example of this. Packaging the computer, keyboard and display screen together is a common arrangement these days, but this unit boasts a functional, yet distinctive appearance. Its base houses the computer itself and a typewriter-style keyboard. Perched atop is a trapezoidal helmet cradling a CRT display screen. The assembly will occupy an 18-in. by 20-in. rectangle on your desk and sit 16 in. tall.

Remove two screws and the lid of the main unit (including keyboard and CRT) swings back on a sturdy

piano hinge along the rear edge. Like the engine compartment of some automobiles, there's even a prop to hold the top out of the way while both hands are busy inside the machine. The bottom plate is formed of massive steel plate; the rest of the enclosure molded of rigid expanded plastic.

The inside is largely empty, its main occupant being a single etched circuit board about 10 in. by 15 in. in size. This board contains the computer, including its input-output circuitry and all memory, as well as the power supply (except for transformer and filter capacitor). The largest integrated circuit chips are held by sockets for ease of replacement. This includes the 8-bit 6502 microprocessor and supporting devices as well as read-only memory—but not the random-access user memory.

Your search for a small speaker or other sound maker will go unrewarded. The CBM, it appears, is as mute as many of the current generation of microcomputers (including the higher-priced Radio Shack model II). There are many times in business computing when a discreet "beep" is a valuable thing—to indicate a critical operator error, or notify when a disk backup procedure is finished, for example. Experienced applications programmers miss this added dimension for communicating with the user. The parts can't be *that* expensive.

The keyboard's 74 keys are connected to the main circuit board by a fat umbilical containing 18 separate wires, suggesting that the main processor is busied with figuring out which key has been depressed. The arrangement leads to some minor operational quirks. Rollover logic, for example, works for some key combinations but not others. (Rollover is the action of depressing two keys almost simultaneously, without releasing one before the other is pushed. Keyboards without at least two-key rollover logic can drop characters for very fast or moderately sloppy typists. The best keyboards—not often found in microcomputers—incorporate "n"-key rollover.) Another quirk: striking certain combinations of three keys at the same time will cause none of them to appear on the screen, but a separate, quite undesired one. Here's a case where the machine *can* make typing errors, if not manipulated properly.



Two aspects of the keyboard hardware/software are more welcome, and, in fact, superior to much of the competition. The keys are of the full-stroke, full-sized electrical contact type, quite comfortable under the fingers. In addition, the systems software allows one level of Basic command to be "typed ahead", while the computer is processing an instruction. The command will then be performed automatically when the processor has finished with its current task.

The display screen is a jewel—an emerald, to be precise. Its crisp, green definition of characters and special graphics symbols puts many other microcomputer displays to shame. Only 40 characters can be displayed per line, with up to 25 lines of type visible at a time. The 40-character width limitation is a bother in word processing applications, since few documents utilize margins this narrow. It's a shortcoming sadly shared by some other micros in the CBM's general price range.

### Graphics pros and cons

Low-cost graphics are among the company's historical strengths. The CBM carries this commitment to a fault. Each of the CRT screen's 1,000 character positions is made up of a 7 by 7 array of tiny glowing green dots, promising a resolution of 49,000 pixels (picture elements) on the 9-in. screen. The individual dots are not accessible to the programmer, but many useful combinations are. Nearly every position has a secondary shifted graphics character associated with it. These range from solid character-sized blocks to thin lines and arc segments to special symbols such as the hearts, diamonds, clubs and spades suits on a deck of playing cards. The symbols are captioned prominently on the front edge of the keys themselves, easing your search for the unfamiliar squiggles. The screen can be set in a green-on-black or reversed black-on-green mode at will. An imaginative programmer can draw almost any chosen picture more conveniently with this than any other microcomputer we know.

Of what use is graphics on a business computer? Very little, if the crop of currently available programs is any indication. Perhaps this is because the system has capabilities not yet appreciated by business programmers. Packages such as payroll and general ledger have come to us by way of large mainframes and minicomputers, where picture-drawing magic is a rarity. There is no doubt, however, that business applications programs could be made more attractive, usable and easily understandable with the judicious use of graphics. We will just have to wait for human talents to catch up with those of their machinery.

For the present, graphics is one of those things that gets in the way of the comfortable use of the CBM as an office computer. On the model we tested, the shifted representation of nearly every key is a graphics symbol. Only the unshifted keys are usable in the traditional sense. (The familiar CONTROL key, often used for secondary case shifting, is missing from this keyboard.) One distressing result of all this is that the row of keys above the alphabet that normally contains numbers is devoted exclusively to punctuation symbols. You have to use the separate calculator-style key pad on the right to enter the numerals 0 through 9, as well as some other often-used symbols, such as the period and dash. It's a difficult transition for those who, after years of practice,

can reliably hit the number of keys on a typewriter without looking. The graphics capabilities can be disabled and a pseudo-standard upper/lower case mode invoked by the forgettable (and undocumented) POKE 59468,14 command. A version of the system is available with a more standard keyboard; it seems a more appropriate choice for this machine's intended use.

The floppy disk drive supplied shares the parent unit's "build 'em stout" philosophy. The unit takes up a bit less desk space, and is constructed mainly of formed steel. The two halves open up like a clam and, yes, there's another automobile-style hood prop. Inside is a pair of 5¼-in. minifloppy diskette drive assemblies, supplied by Shugart. The drives accommodate soft-sectored, double-density diskettes that will each hold some 170K bytes (characters) of information.

The drive electronics are distributed over four circuit boards: a small head-position servo card for each drive, a shared analog circuit card and large digital logic card. The latter contains at least as much computing horsepower as the main processor (including its own 6502 chip).

The disk drive communicates with the main processor via the IEEE-488 interface protocol. This is the same as the computer-to-instrumentation standard developed as Hewlett-Packard's HP-IB, and it's a pleasant surprise to find it a part of the CBM. It works like this: a single cable connects to the rear of the main processor box and daisy chains to each peripheral in turn. In this case, these peripherals start out with the floppy disk drive and printer. Each device is assigned a hardware address, referred to by the software when data is to be transferred to or from it. The arrangement is far neater than the traditional one, where individual cables of differing electrical and mechanical specifications are routed from each peripheral device to the main computer.

If elegant in concept, the IEEE-488 bus is flawed in at least one execution detail. The end of the cable that connects to the computer is a push-on socket that clutches the protruding edge of the main processor circuit board. It's one of three such connectors, and they are not labeled. The only thing that keeps you from plugging a cable into the wrong one is a fragile flake of plastic, easily crushed if the wrong plug is tried. Even if you choose correctly the first time, the shard is likely to slip out and drop into the dark innards of the computer when the cable is next unplugged. A careful reading of the instruction manual will keep you from damaging the computer, but a better design is clearly needed here.

### Fast printing speed

The small printer that's supplied incorporates the well-engineered Epson dot matrix mechanism. It will print 80 characters across sheets of paper up to 10 in. in width. The paper must be of the continuous pin-feed type, since the printer does not utilize a roller for feeding the paper through. Individual sheets of paper, such as letterhead or envelopes, can't be used. Printing speed is up to 150 characters per second, but this is realizable only on those lines containing the full 80 characters. The reason is that the print head carriage assembly moves at constant velocity across the page, and has no way to move quickly back to the left margin after printing a short line. The logic circuitry within is notable in that the entire complement of graphics



characters available to the screen can be duplicated on the printed page. It's a valuable capability that can't be duplicated on many printers with much higher price tags.

Commodore-supplied software is the gelled-type called firmware. Common in personal computers but unusual in business class machines, the arrangement carries a hidden benefit: it's crash-proof.

What does this mean? Software programs are normally entered into computer memory from a diskette, where they reside, so long as they are doing their work. Firmware is the term for program instructions supplied as permanently-embossed patterns in a tiny plug-in integrated circuit chip. This device, also called read-only memory (ROM), is inserted mechanically into the processor board. Once inserted, a program in firmware can't be altered by anything short of bodily harm to the computer.

"Crashes" in computers are conditions where the machine appears to be locked up, unresponsive to your attempts to get its attention. It usually happens because the mechanism is executing an unplanned-for endless loop of useless instructions. The most common cause is a garbled instruction in one of the programs. This can happen for a variety of reasons, including power line surges and programmer brain fade. But a program cast in a ROM chip—firmware—*can't* be garbled by any means that leaves the rest of the computer undamaged. Thus, the crash-proof computer.

The main processor contains eight sockets for plug-in ROM chips. As delivered, all but three are occupied. They contain Commodore's systems software: the disk operating system and Basic language. It's appropriate that software of this sort be embalmed in ROM, since it's the kind that rarely—if ever—needs to be altered. The three remaining empty ROM sockets await applications programs. The financial planning program VisiCalc, as well as the WordPro word processor, for example, each come in their CBM incarnation with a plug-in ROM, as well as additional software in floppy diskette form.

### One major drawback

The operating system is the all-important software that establishes a computer's personality to the user, since part of its function is to manage communications to and from the human-readable interfaces: keyboard, screen and printer. It is in this area where the prosaic lineage of the system shows up in its most annoying form. The Pet operating system simply wasn't designed for business, and it shows.

The unsophisticated user could be fooled into thinking that the system has no operating system at all—just a Basic language. Nothing could be further from the truth, of course, since Basic was not designed for such things as managing disk transfers and communicating via the IEEE-488 bus to other peripherals. It's the operating system's job to handle these functions. But in this case, important communications between the user and operating system must be strained through the highly inappropriate syntax of the Basic language.

By all appearances, the disk operating procedures were spliced onto, rather than integrated into, the Pet operating system. This shows up in the complexity of the Basic file reading and writing statements, as well as the PRESS PLAY ON TAPE #1 command, which occasionally appears unbidden on the screen. This is in

reference to an audio cassette tape drive, not supplied with the system, and, most would agree, not appropriate on a serious business computer.

While exploring the capabilities of CBM's Basic, we were initially alarmed when we couldn't find the PRINT USING construct represented. (This is the all-important facility that allows a programmer to easily line up the decimal points in a column of financial numbers, for example.) We found we were looking in the wrong place. It's the CBM's *printer* that takes care of the fancy number formatting, not the software!

### Unusual formatting procedure

In Basic, the programmer opens two file channels to the printer: one for the "using" mask, the other for the data itself. The printer hardware saves the mask as sent over one channel, and uses it to re-arrange data transmitted via the other, so that it looks pretty on the page. The full range of normal PRINT USING formats are supported: floating dollar sign, trailing minus sign, etc. It's an unexpected—but not necessarily inferior—way of handling the formatting problem. The technique does, however, carry two undesirable side effects: data formatted for the display screen must be handled in a quite different manner than that destined for the printer; and a departure such as this only worsens the problem of translating Basic applications programs from other computers.

In processing speed, the class of the agile 6502 microprocessor shows through. The Basic was able to execute our Prime Number Cruncher benchmark program (IA Jun 80) in 1,159 seconds. That's about 20% slower than the similarly-equipped Apple II+; 40% faster than Radio Shack's TRS-80 model I, with its Z80 microprocessor.

The documentation is a bit of a puzzle. It fundamentally consists of four things: a user's guide, separate (and larger) user manuals for the floppy disk drive and printer, and a suggested reading list. Strike the word suggested, for the other three books are inadequate to stand on their own. First on the suggested list is an extra cost user manual, and it's followed by nearly a dozen Basic language tutorials. CBM-specific Basic knowledge is scattered sparsely across the three manuals supplied with the system. Nowhere is there a comprehensive listing of the Basic commands and how each can be used.

The system, as described here, lists for \$3,385. This breaks down into \$1,295 for the terminal/processor unit, another \$1,295 for the dual floppy diskette drive and \$795 for the printer. At that price, the processor contains its maximum complement of 32K bytes of user memory. Applications programs, such as VisiCalc and WordPro, are priced separately. A 16K-byte version is available at a \$300 saving, but a lot of business programs (including VisiCalc and WordPro) require the full 32K bytes to work properly.

It has also been announced that a version with a "true" disk operating system, designated 4.0, will soon be available. In addition to featuring more integrated disk commands, the new firmware is said to operate faster and to support another new product: an 80-column display screen. It appears that the company (or the marketplace) has spotted the same shortcomings we have in the system's current stage of development. □

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# Sounds of the Atari ...in Basic

## Part V Random Generation of Sound



by Herb Moore ©

We've demonstrated a number of ways to determine patterns of sound and graphics for the Atari computer, as well as ways to allow the user to input information while a program is running. So far, all of the sequences have been specifically defined in the program or through the input statement. Let's now look at ways to allow the computer to randomly generate some choices of its own.

Suppose you want the computer to generate a random number between 0 and 10. The statement to do this would be: `10*RND(1)`.

To see what numbers the machine is generating, you can enter this statement in a short program.

```
10 PRINT 10*RND(1)
20 FOR T = 1 TO 100
30 NEXT T
40 GOTO 10
```

If you run this program, the machine will generate and print numbers with a decimal point followed by a fractional part. For most applications, you'll want to generate whole numbers or integers. The statement to do this is: `INT (10*RND(1))`.

Change line 10 of the program above to:

```
10 PRINT INT(10*RND(1))
```

Now when you run the program, the machine will print all whole numbers from 0 to 9 inclusive.

In order to have the machine select integers between 1 and 10 the random number function in line 10 is changed as follows:

```
10 PRINT INT(10*RND(1) + 1)
```

You can use a random integer function in a `SOUND` statement also.

```
10 SOUND 0,INT(100*RND(1) + 101),10,10
20 FOR T = 1 TO 25
30 NEXT T
40 GOTO 10
```

This program will randomly select note values between 100 and 200 to be played each time through

the program loop. The program seems to provide an interesting variety of notes, but the duration of each is too consistent to make a very interesting listening pattern overall. By adding a random function to the duration loop, you can introduce variety in the length of notes. Here's a program that puts a random time loop in a subroutine and then has each of the four voices play a randomly selected note from one of four different parts of the spectrum of note available in Atari Basic.

```
10 SOUND 0,INT(60*RND(1) + 1),10,10
20 GOSUB 500
30 SOUND 0,0,0,0
40 SOUND 1,INT(60*RND(1) + 60),10,10
50 GOSUB 500
60 SOUND 1,0,0,0
70 SOUND 2,INT(60*RND(1) + 120),10,10
80 GOSUB 500
90 SOUND 2,0,0,0
100 SOUND 3,INT(60*RND(1) + 180),10,10
110 GOSUB 500
120 SOUND 3,0,0,0
200 GOTO 10
500 FOR T = 1 TO INT(30*RND(1) + 10)
510 NEXT T
520 RETURN
```

In the time loop, `T` will have a random value between 10 and 30. The first voice will play a random note value between 1 and 60 for a random duration, determined by subroutine 500.

The second voice plays a note between 60 and 120. The third plays between 120 and 180, and the fourth voice between 180 and 240. This program begins to introduce considerably more variety in the tonal patterns generated.

You can use a random function with `IF-THEN` statements discussed in the last issue to randomly select a note from a specific set of notes. To demonstrate this, here's a program that will pick one of the three notes from a C Major triad four times and then pick a note from a G Major triad four times.

```
10 FOR CYCLE = 1 TO 4
20 N = INT(3*RND(1) + 1)
```



```

30 IF N = 1 THEN N0 = 121
40 IF N = 2 THEN N0 = 96
50 IF N = 3 THEN N0 = 81
60 SOUND 0,N0,10,10
70 FOR T = 1 TO 20
80 NEXT T
90 SOUND 0,0,0,0
100 NEXT CYCLE
110 FOR CYCLE = 1 TO 4
120 N = INT(3*RND(1) + 1)
130 IF N = 1 THEN N1 = 81
140 IF N = 2 THEN N1 = 64
150 IF N = 3 THEN N1 = 53
160 SOUND 1,N1,10,10
170 FOR T = 1 TO 20
180 NEXT T
190 SOUND 1,0,0,0

```

It is also possible to input a numeric value to a random function. This application would be useful if you wanted to limit the range of a particular sequence of notes played. Here's a program that allows the user to make such a choice through an INPUT statement.

```

10 PRINT "PICK A NOTE RANGE BETWEEN"
11 PRINT "0 AND 255"
20 INPUT N
30 FOR CYCLE = 1 TO 100
40 SOUND 0,INT(N*RND(1) + 1),10,10
50 FOR T = 1 TO 40:NEXT T
60 NEXT CYCLE

```

A few graphics statements will give a visual representation of the range established by the value of N which is input at line 20. The addition of

```

5 GRAPHICS 6
6 COLOR 1
7 SETCOLOR 2,8,2

```

will cause the computer to enter a graphics mode which has a text window in which the PRINT statement can be displayed. Mode 6 provides 158 columns and 80 rows for plot points. Add the following.

```

31 N0 = INT(N*RND(1) + 1)
32 A = N0/2
33 B = INT(75*RND(1) + 1)
35 PLOT A,B

```

Change line 40 to: 40 SOUND 0,N0,10,10.

This will cause points to be plotted in an area from the left side of the screen. The range of that area will be a function of the value of N which is input at line 20.

With instruments like the violin or the human voice, there is a technique called portamento. This refers to the sliding from one note to another without any break in the sound. This effect can be accomplished in Atari Basic using a FOR-NEXT loop as follows.

```

10 FOR X = 1 TO 25
20 SOUND 0,121 + X,10,10
30 NEXT X
40 SOUND 0,0,0,0
50 FOR T = 1 TO 100:NEXT T
60 GOTO 10

```

This will result in a note that will begin at middle C and slide to a lower note. You'll remember that an increased value for the note parameter causes a lower

note to be played by the computer. To create an ascending tone, change the value of the note parameter in line 20 to 121 - X. This will result in a tone sliding upwards from middle C.

If you wished to randomize the length of the slide in this program, you could change line 10 to something like: 10 FOR X = 1 TO INT(40\*RND(1) + 20).

This would result in a slide of varying length. With this information, it is possible to develop a program that will randomly select from a series of notes in any given passage. At the same time variables such as repetitions of a given cycle, note duration, and length of portamento (slide), can be determined by INPUT statements. Here's an example of a program which makes use of these possibilities.

```

10 GRAPHICS 6
20 COLOR 1
30 SETCOLOR 2,6,2
40 PRINT "NOTE DURATION"
50 INPUT Z
60 PRINT "TIMES THRU C MAJOR CYCLE"
65 INPUT C
70 PRINT "TIMES THRU E MIN CYCLE"
75 INPUT E
80 PRINT "TIMES THRU G MAJ CYCLE"
85 INPUT G
90 PRINT "LENGTH OF SLIDE"
95 INPUT Y
100 FOR CYCLE = 1 TO C
110 A = INT(4*RND(1) + 1)
120 IF A = 1 THEN N0 = 121
130 IF A = 2 THEN N0 = 96

```



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```

140 IF A = 3 THEN NO = 81
150 IF A = 4 THEN NO = 64
160 GOSUB 500
170 NEXT CYCLE
200 FOR CYCLE = 1 TO E
210 A = INT(4*RND(1) + 1)
220 IF A = 1 THEN NO = 96
230 IF A = 2 THEN NO = 81
240 IF A = 3 THEN NO = 64
250 IF A = 4 THEN NO = 53
260 GOSUB 500
270 NEXT CYCLE
300 FOR CYCLE = 1 TO G
310 A = INT(4*RND(1) + 1)
320 IF A = 1 THEN NO = 162
330 IF A = 2 THEN NO = 128
340 IF A = 3 THEN NO = 108
350 IF A = 4 THEN NO = 72
360 GOSUB 500
370 NEXT CYCLE
500 W = INT(2*RND(1) + 1)
501 IF W = 1 THEN 506
502 IF W = 2 THEN 504
504 FOR X = 1 TO Y
505 GOTO 510
506 FOR X = Y TO 1 STEP -1
510 SOUND 0,NO + X,10,10
520 NEXT X
530 FOR T = 1 TO Z
540 NEXT T
550 P = INT(150*RND(1) + 5)
560 Q = INT(70*RND(1) + 5)
570 PLOT P,Q
600 RETURN

```

The cycles established in lines 100-170, 200-270, and 300-370 in this program consist of the notes of a C Maj 7 chord, an E minor 7th chord, and a C Major chord with added 9th.

Lines 40 and 50 allow the user to affect the note duration as established by the value of z in lines 530 and 540.

Lines 60 through 85 allow for the determination of the number of cycles for each chord.

Lines 90 and 95 allow for an INPUT to establish the length of the portamento (slide).

This slide is executed by the FOR-NEXT loop in lines 500-520. Lines 500-502 create a random choice between an ascending and descending slide.

The ascending slide results in a final note of the portamento that is some distance from the pitch values established by the values of NO in the main program. You'll find that small numeric values for the slide like 4, 5, or 6 will result in an interesting sound that is still recognizable in terms of western tonality.

A very long slide value such as 30 or more, combined with longer note durations like 200 or more, will result in a completely different sounding sequence that cannot be as easily recognized as the chords being played.

You might try experimenting with things like randomizing the note duration by knocking out lines 40 and 50 and entering a random INT function for Z in line 530.

A similar possibility could exist for the length of slide by using a random INT function there also.

Lines 550 through 570 simply plot a few points to provide some screen activity while the program is running. □



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\*Includes both compile and run time

by Hillel Segal

Over the past six months in this column, we've looked at computer systems by six manufacturers, all priced under \$15,000. Each has been placed in the hands of independent consultants, who test the computer for CPU and disk I/O speed, then run three different application programs. Of these three, we've focused on the Accounts Receivable program for the comparisons here.

Now we're at the point where some comparisons can be made between the systems tested so far in the Association of Computer Users' benchmark series. It would be tempting to look at the scoreboard shown above and declare a price/performance winner right away. But would that be fair? And, even more important, would it be useful?

Among the computers tested in the first half of this 12-system series, there is a 3-to-1 spread in the elapsed time needed to run a typical business application program using both disk drive access and general computation resources of the computer. Is that such a big deal? Or is a computer more than just a set of pieces that can do a job fast?

We would be the first to point out that more is involved in a successful computer installation than a combination of storage and number-crunching components. Just as a human being's significance is not limited to his or her performance time in the 100-yard dash, neither is a computer's value measured by speed tests alone. Much, much more is needed to create a working

system, and many fine details of engineering cannot be measured with a stopwatch. Nevertheless, we feel that price/performance comparisons add a very valuable element of objectivity to the evaluation of computers.

To properly determine what the benchmark results mean, a look at the functions involved in the various tests is in order. Some check speed for the CPU and some compare disk I/O access; others are combinations of these elements. The Accounts Receivable test uses both the CPU and disk, but involves no printing. In the benchmark report issues, another variant of the A/R test prints the report, adding the element of printer speed to the combination.

Not discussed here, but prominent in the full reports, is a test of the system's speed in a complicated mathematical problem. In this test, called the Scientific/Engineering problem, the system solves a set of 50 simultaneous equations with 50 variables. It's mostly a check of language and logical sophistication. Using no disk access, it provides a glimpse of the computer's suitability for difficult computational tasks that might be encountered in a laboratory or research center. These tests are quite different in nature, and systems that do well in one test do not always perform similarly in the other.

Using the real-life application tests as a guide, one can get a rough idea of the relative strength of various computers in two broad areas: business-related tasks, where disk access is an important part of the picture, and mathematical problem-solving tasks that need greater power in areas such as math functions. The other tests, which home in on more specific tasks to



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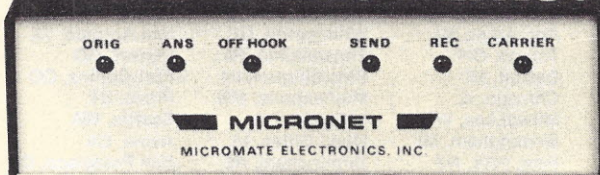
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the exclusion of other areas, can help round out the picture of hardware capabilities.

But these are not the only vital considerations. Several other aspects are equally important.

Hardware and accessories play a key role in determining the basic capabilities of the system. Most important to consider are the memory capacity, diskette or hard disk storage capacity, number of terminals that can be utilized and communications features. Microcomputers are often limited to a maximum of 64K bytes of memory; this is enough for

## Hardware and accessories play a key role in determining system capabilities.

most single-user applications, but tends to become a limiting factor in multiple-user configurations and may prevent more complex operations from running. Disk storage is the key to many mailing list or accounting programs, and computers with small disks tend to be unsuitable for the larger accounting packages.

While microcomputers were once thought of as exclusively single-user systems, many are now available with multiple ports to handle several tasks at once. But just looking at the number of ports may be misleading; memory capacity, disk access time or computational power may prevent a multi-user system from functioning effectively in practice.

Communications is an area of increasing importance, as computers become more widespread and time-sharing services more available to the occasional user. Most common of communications links is the asynchronous RS-232 protocol, and this is offered as an option on most computers now. But other types of communications links, such as IBM-type bisynchronous, packet-switching, and other systems are widely used in certain environments. Before buying equipment intended to work in conjunction with other computers, it's essential to make sure that the protocols are compatible.

Operating system and language are the heart of computer software, determining the environment in which all programs will run. Many manufacturers use their own unique operating system, which may mean a lack of compatibility with software designed for other systems. Others choose a widely-used system such as CP/M, giving the user a broad range of off-the-shelf programs to select from. Finally, some firms make equipment which runs on an operating system designed to be identical to a competitor's (such as IBM) with the idea that all the existing software written for the competition will work on their system. Each of these strategies has its place, but the customer should check for himself just how much software is available for his chosen computer, rather than accepting the vendor's word entirely.

Language choice relates to the function of the computer, the capabilities of the programming staff,



# dBASE™ II vs. the Bilge Pumps.

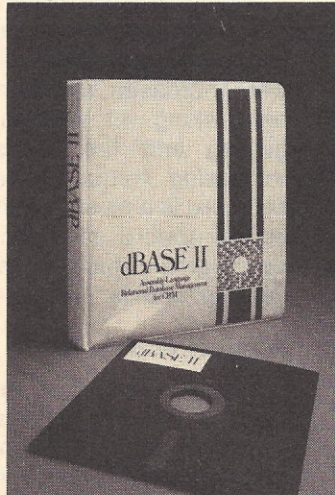
by Hal Pawluk

We all know that bilge pumps suck.

And by now, we've found out—the hard way—that a lot of software seems to work the same way.

So I got pretty excited when I ran across **dBASE II**, an assembly-language relational Database Management System for CP/M. It works! And even a rank beginner like myself got it up and running the first time I sat down with it.

If you're looking for software to deal with your data, too, here are some tips that will help:



## Tip #1: Database Management vs. File Handling:

Any list or collection of data is, loosely, a data base, but most of those "data base management" articles in the buzzbooks are really about file handling programs for specific applications. A real Database Management System gives you data and program independence (no reprogramming when data changes), eliminates data duplication and makes it easy to turn data into information.

## Tip #2: Assembly Language vs. BASIC:

This one's easy: if you're setting up a DBMS, you're going to be doing a lot of sorting, and Basic sorts are s-l-o-w. Run a benchmark on a Basic system like S\*-IV against a relational DBMS like **dBASE II** and you'll see what I mean. (But watch it: I've also seen one extremely slow assembly-language file management system.)

## Tip #3: Relational vs. Hierarchal & Network DBMS.

CODASYL-like hierarchal and network systems, around since the 1960's, are being phased out on the big machines so why get stuck with an old-fashioned system for your micro? A relational DBMS like **dBASE II** eliminates the pre-defined sets, pointers and complex data structures of a CODASYL-type DBMS. And you don't need to be a programmer to use it.

## dBASE II vs. everything else.

**dBASE II** really impressed me.

Written in assembly language (with no

need for a host language), it handles up to 65,000 records (up to 32 fields and 1000 bytes each), stores numeric data as packed strings so there are no round-off errors, has a super-fast multiple-key sort, and supports ISAM based on B\* trees.

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(so when you've set up the formats, your secretary can do the work). Its report generator and user-definable full screen operations mean that you can even use your existing forms.

And if all this makes your mouth water, but you've already got all your data on a disk, that's okay: **dBASE II** reads your ASCII files and adds the data to its own database.

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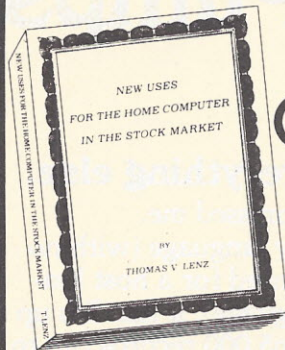
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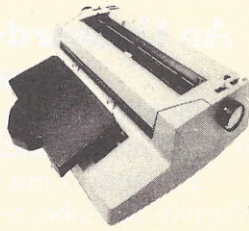
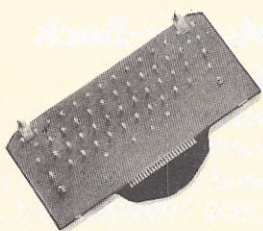
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and the match with other systems already in use or contemplated. An industry-standard language such as Basic, Pascal, Cobol, or Fortran is often the wisest choice, since trained staff is easier to find and more programs in the language already exist. But in certain cases, a specialized language or even a single-manufacturer language may be desirable. The exact choice should definitely be one which is suitable for the application: Fortran for scientific use, Cobol for business, or Assembler for games and high-use subroutines, for instance.

Applications software is often the determining factor in a system purchase, and rightly so. As the price of hardware decreases, the relative importance of software increases, since program development costs are rising along with salaries. Furthermore, computers are getting into the hands of non-programmers with increasing frequency, and that means ready-to-go software is a must. If in-house programming is contemplated special attention should be paid to program development facilities such as the program editor, debugging aids, and so on.

### Support is important

Vendor support is especially critical for first-time users, but is also necessary for others as well. Beyond the obvious need for spare parts and hardware maintenance are a range of requirements that may include software help, training for new operators, and documentation written for the type of user the computer is likely to have. Companies like IBM have built a reputation for a high level of support, often referred to as “hand-holding,” but other firms serving business clients may have service just as good. On the other hand, technically expert users may not require a lot of assistance, and should consider buying from a supplier who does not provide (and therefore doesn't charge for) such a high level of support.

Add-on capacity is a frequently-overlooked area by many, though forward-thinking types generally are not surprised. Suffice it to say that a well-planned system includes a growth path at least a few years into the future. In this industry, it's almost impossible to look much further ahead than that. But a well-chosen computer is an asset to its users, and often new applications are found after installation; be prepared to expand its usage into new areas after the original needs are satisfied.

While many of the points we've made in this article may be obvious to experienced users, they form a useful counterpoint to the information provided by the benchmark reports. □

*Hillel Segal is president of the Association of Computer Users, a non-profit association with members all over the U.S., Canada and several other foreign countries.*

*One of the association's key activities is the publication of its Benchmark Reports. Each month a new report is produced covering a computer system.*

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JULY 1981



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```

REM  MERGE SORT USING LINK () FOR INDEX
FUNCTION  MERGE (I,J=INTEGER)=INTEGER
  VAR T,K,M=INTEGER
  IF ARRAY (I) < ARRAY (J) THEN
    BEGIN
      M=I
      I=J
      J=M
    END
  T=I
  KM=T
  I=LINK (I)
  WHILE I<>0 DO
    BEGIN
      IF ARRAY (I) < ARRAY (J) THEN
        BEGIN
          M=I
          I=J
          J=M
        END
      LINK(KM)=I
      KM=I
      I=LINK(I)
    END
  LINK(KM)=J
  END=T
FUNCTION  SORT(IS,JS=INTEGER)=INTEGER
  VAR KS,II,JJ=INTEGER
  IF IS=JS THEN
    BEGIN
      LINK(IS)=0
      RETURNED VALUE=IS
      GOTO  OEND
    END
  KS=IS+((JS-IS)/2)
  II= SORT (IS,KS)
  JJ= SORT (KS+1,JS)
  RETURNED VALUE= MERGE(II,JJ)
OEND      END=RETURNED VALUE

```

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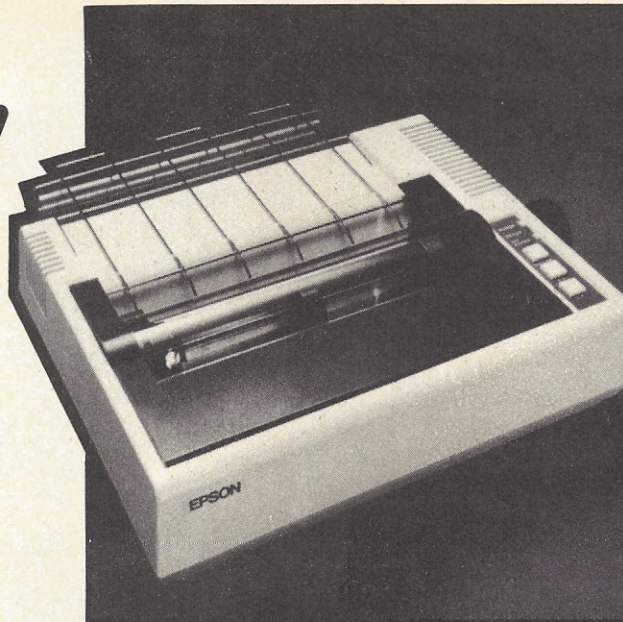
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# High Quality in Printed Output

## The Epson MX-80 Printer

by Roger H. Edelson



For less than \$550, the personal computer enthusiast (and the cost-effective businessman) can obtain an 80 CPS printer which produces copy rivaling that of the much more expensive types. The Epson MX-80 printer and its printer mechanism (model 3210) was developed by Epson's parent company, the Japanese firm Shinshu Seki which is also noted for its Seiko watch division. The company manufactures more printer mechanisms than any other company in the world—mechanisms that are used not only in their products, but other companies' printers, as well and Epson is the worldwide marketing arm. This printer with its high MCBF (mean characters between failures), full tractor-type pin feed, and user replaceable print head can hold its own in the business environment.

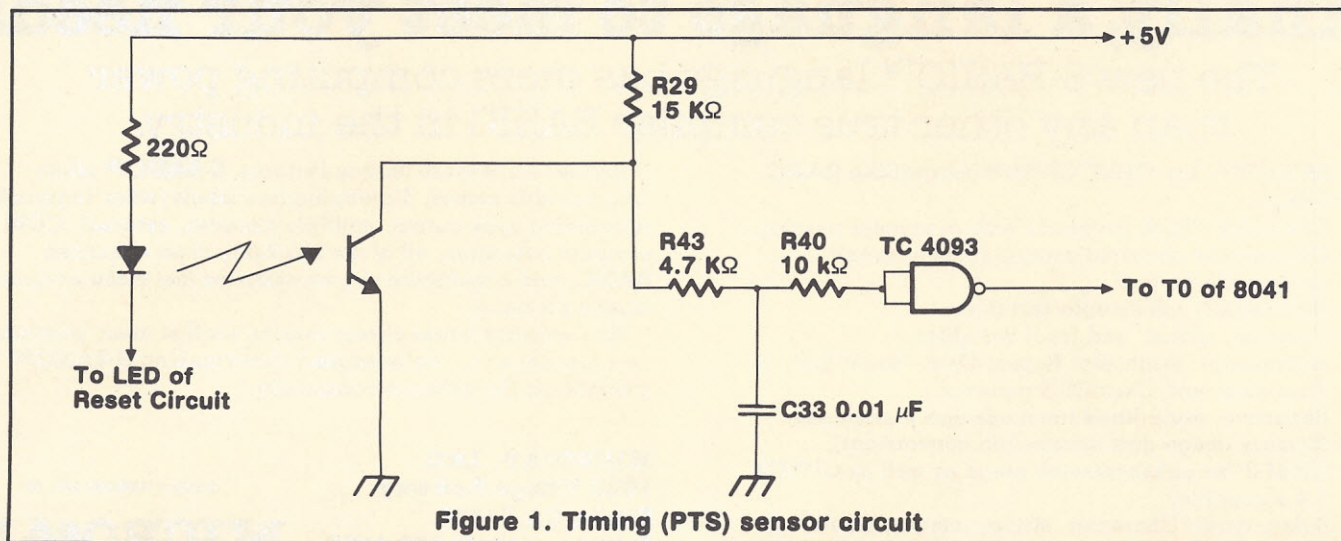
While we will fully cover the mechanical and electrical features highlighting the design of the remarkable machine, the real story is the quality of the printed output. The print is fast, clear (with true lower case descenders), and provides a software controlled choice of 12 different weights and sizes. While not quite good enough to fool the reader into thinking the letter was actually typed, the multi-stroke, or multi-pass styles definitely will meet almost all correspondence requirements. If instead, a character set with an excellent speed-reliability product is desired, the

standard 10-CPI format, formed from the 9 by 9 matrix will fill the bill admirably.

The MX-80 is housed in an attractive low profile plastic case measuring 4.2 in. high, 14.7 in. wide, and 12 in. deep. The paper movement knob protrudes unobtrusively from the right side of the case, and the very functional paper separator is attached to the upper rear surface. As the printer implements a full tractor feed, it possesses a paper movement knob that allows easy, rapid paper feed, both forward and, to a limited extent, backwards. Some other printers utilize a solenoid paper advance mechanism and cannot provide any reverse paper movement.

The tractor feed is fully adjustable from a minimum of 4 in. to the full 10-in. width. I have conveniently set it for printing standard paper width. The input/output separator incorporated into the paper feeding mechanism is an inexpensive, yet very effective, design. I have never had the paper feed jam or entangle itself.

The paper feed mechanism also incorporates an out-of-paper detector that provides warnings when the paper supply is nearly exhausted. When the printer detects an out of paper status, it sounds a raucous buzzer intermittently for 30 seconds and halts further interface controlled paper movement. In order to remove the paper for replacement, the printer will again





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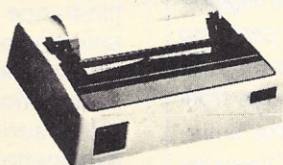
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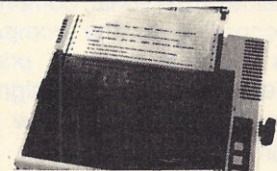
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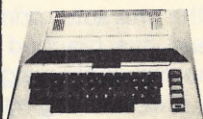
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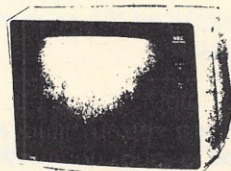
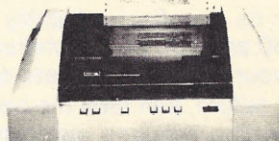
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60 INTERFACE AGE CIRCLE INQUIRY NO. 82

respond to the line-feed switch after the buzzer has completed its warning cycle. The printer also incorporates an easily initiated self-diagnostic mode that allows a check of the print head operation and the printer mechanisms. To perform the selftest operation, depress the LF (line-feed) switch when turning the computer power on. This mode is preprogrammed and will immediately begin printing out all the characters provided by the internal software.

The mechanical and physical design is excellent. I would prefer a standard replaceable type instrument power cord and an externally replaceable fuse. The company however, feels a replaceable power cord is just one more item to keep track of, and is actually a hindrance in the small business/personal computing environment. The fuse, according to the company, should never blow unless there is a major printer malfunction, therefore its replacement should signal a more serious problem. I'm not sure I swallow this explanation entirely—though I haven't tried it.

Speaking of the possibility of impeding the printer head motion, the design of the head drive function is rather unique; the actual position of the print head is monitored by the electronics, and the character printing cycle is not initiated until the head has reached the desired position. In actual use, one can apply a significant drag force to the print head, and, so long as it's movement is not halted entirely, the printed line will still be correctly spaced. The circuit that accomplishes this position sensing and feedback is shown in figure 1. An LED and phototransistor assembly monitors the position of the head assembly by using the slots in a disk connected to the printer head positioning motor. A resistor-capacitor integrating circuit is used to prevent the waveform of the output signal from being affected by noise or mechanical vibrations.

The design of the print head is one of the unit's major features and not just for its excellent reliability (a life expectancy of between 50 and 100 million characters). Once you have printed your 10,000 + sheets of print and experience your first failure, just take the head out and replace it. The operation requires approximately five minutes and the new head costs approximately \$30, and once you have completed the exchange, the printer is off and running again.

### Easy printer set-up

Setting up the printer for operating is literally a snap—the paper separator "snaps" into place in the slots provided, as does the plastic lid. The ribbon cartridge also simply "snaps" into place, and with a life expectancy of over 3 million characters, it will be a while before you need to replace it. The paper loading is equally convenient and the manual paper movement knob facilitates the alignment of initial top-of-form position (the position in which the first print line lies on the form, determined by the paper position when power is first applied to the unit). Should you have to change this position during a printing operation, it is necessary to turn the printer power switch off, and then on again. It would have been more convenient if a push-button switch had been provided to reinitialize the printer when it is desired to change this position.

It is possible to initialize the printer by software control through the activation of the INIT\* line available at the parallel interface connector. A "low" going pulse

JULY 1981



of a minimum of 50  $\mu$ sec. is required to trigger the initialization cycle. The line should be driven by a TTL circuit, or its equivalent. Obviously, an enterprising hardware hacker could quite easily add his own top-of-form initializing pushbutton.

The function responsible for most of the printer's characteristics, including the character set and the print sizes/styles, is the control circuit board. This is implemented with an 8049 CPU with associated ROM and peripheral chips.

The overall printer architecture is based on a dual microprocessor chip design that allows the company to implement bidirectional printing with logical seeking of the shortest lines. To do this, the 8041 MPU in the model 3210 printer mechanism functions as a slave microprocessor controlled by the main chip, the 8049. The 8049, and its associated programming, gives the MX-80 the capability of providing three additional printing modes (besides the standard single stroke character): 1) double—advance paper 1/206th in. and repeat line, 2) emphasized—shift right and double strike, and 3) double emphasized—a combination of the first two.

#### ROM set announced

As presently supplied, the 4K ROM program allows 64 block graphic characters to be printed in addition to the full 96-character ASCII set, with lower case descenders. In the near future, the company will announce a retrofit ROM set that will also provide a bit graphics mode for the printer with picture resolution in excess of 140 by 120 dots/inch. This ROM set should cost between \$75-\$100. It would be nice if the com-

pany supplied the ROM codes and program so that it would be possible to make user modifications to the printer mode control codes. This would allow the implementation of character format control when using the printer with some text editors where "escape" sequences cannot be imbedded in the text.

#### Printer acceptance

The company has indicated this information is considered private and they have no intention of distributing it. All is not lost, however. Because of the fantastic acceptance of this printer, an MX-80 users group is forming, which will be supported by the company. One can hope that soon some enterprising member will "read" the ROM and disassemble the code for the group.

The use of a microprocessor for printer control also provides sophisticated forms handling features including programmable line feed lengths (from 1/72 in. to 85/72 in.) and a programmable form feed of up to 66 lines. The system design further allows up to 112 horizontal and 64 vertical tab positions.

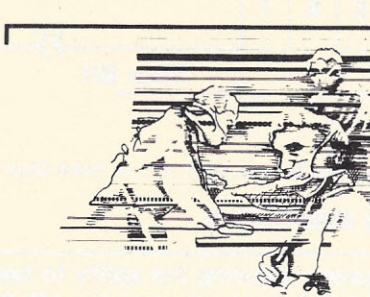
The standard interface between the printer and the host computer is based on a Centronics-compatible parallel port with an internal one-line buffer. However, optional circuit boards are available that plug into the main printer circuit board to provide interfacing with the IEEE-488 Bus, the Apple II, the TRS-80, and an RS232C/current loop serial port. The model I evaluated came with the optional RS232C interface board.

The installation was again a snap; the hardest part was separating the two case halves. This interface provides for a full handshaking protocol as shown in

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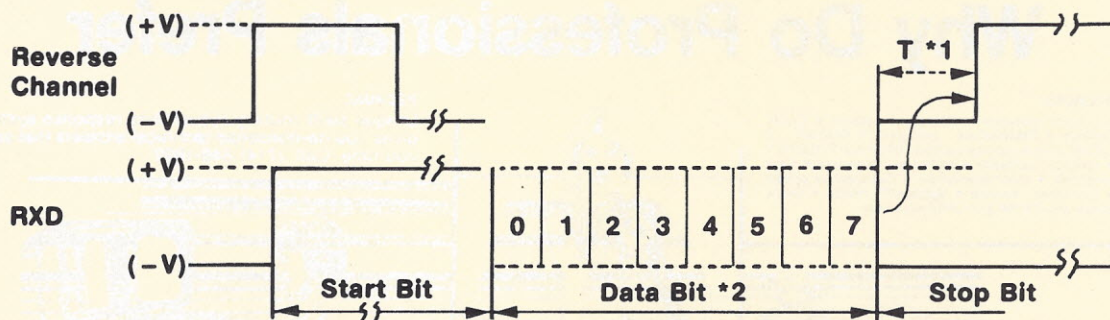


# Timing Chart

## Signal Description and Pin Assignment of I/F Board Connector

Pin No.	Signal Name	Direction	Description
1	Protective Ground		Chassis ground.
2	Transmitted Data (TXD)	Out	The signal is always at "MARK."
3	Received Data (RCD)	In	Received Serial Data.
6	Data Set Ready (DSR)	In	This signal be at the positive EIA level for the printer to receive data.
7	Signal Ground		Return path for data and control signals.
8	Data Carrier Detect (DCD)	In	This is the same signal as DSR at pin No. 6. DCD and DSR can be held at "SPACE" internally. The signal polarity is factory set to "SPACE."
11	Reverse Channel (= 2'nd RTS)	Out	This signal is at the positive EIA level when the printer is ready to accept data entry, and at the negative EIA level when the printer is not ready to accept data entry.
20	Data Terminal Ready (DTR)	Out	Operator can invert the polarity of this signal by the internal jumper.
17	TTY-TXD	Out	Low impedance ("MARK") between pin Nos. 17 and 24 when the printer is ready to accept data; high impedance ("SPACE") when the printer is busy.
24	TTY-TXD Return		Operator can invert the polarity of this signal by the internal jumper.
25	TTY-RXD	In	Input data of serial current loop.
23	TTY-RXD Return		

**NOTES:** 1. "Direction" is the direction of signal flow as viewed from the Printer.  
2. All signals except TTY-TXD and TTY-RXD are based on EIA RS-232C level.



\*1 The value of "T" varies according to the input data.

\*2 The word structure of the serial data is: 1 Start bit + 7 or 8 Data bits (selectable by operator) + 1 or more Stop bit.

**Figure 2. RS232C interface signal/timing description**

figure 2. Even with this handshaking, I experienced some difficulty with the printer-computer interface until I set the baud rate at 9600. The company had indicated that this might be the case, and mentioned that an improved RS232C interface would soon be available (with 2K of character storage), which would solve this difficulty. Once I found that the printer would work reliably at the 9600 baud setting, I experienced no further problems with the available interface.

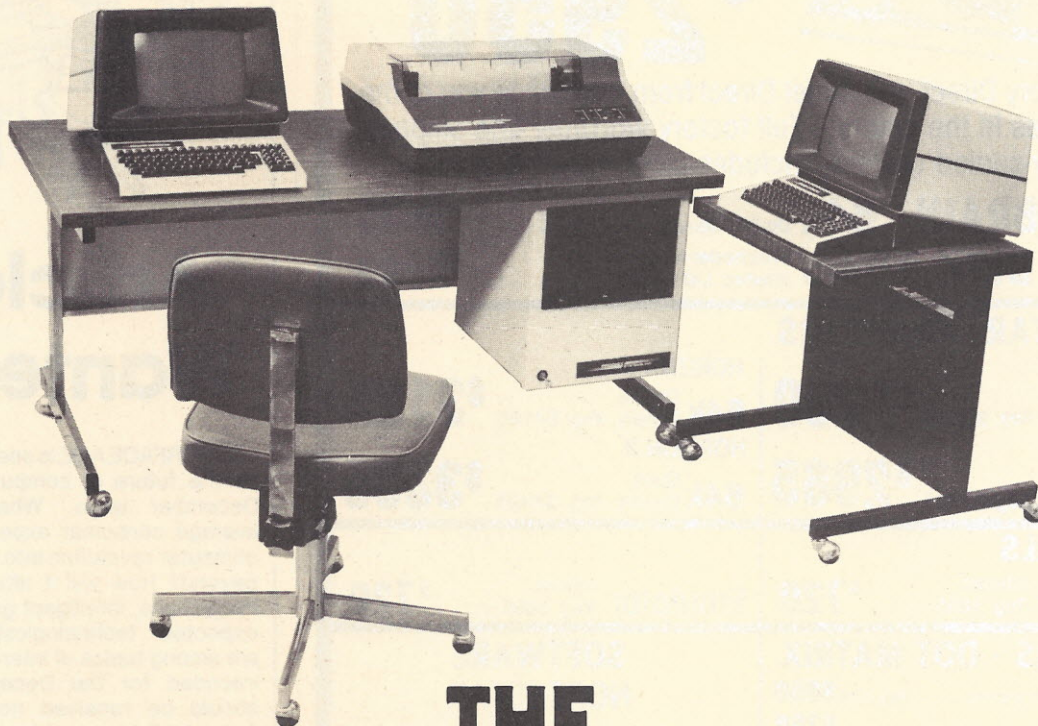
One advantage of using the 9600 baud rate is that the serial interfaces between my computer and printer and my computer and terminal are the same. This allows me to switch my printer to the auxiliary port on my TeleVideo 920 terminal and quickly print out the information presented on the screen.

For those users requiring the ability to handle wider paper, the MX-100 is identical to the MX-80, except that it will print on paper up to 15.5 inches in width. Further expansions of the Epson line will include an FT model that will provide both tractor and pressure paper feeds. Unfortunately the paper feed mechanism will not be compatible with the present version of the printer. Both the above mentioned models will, however, cost considerably more than the basic MX-80. Another model, just announced, is the MX-70 which is a somewhat stripped-down version. For those requiring a machine loaded with sufficient features and quality to use in almost any printing environment, at a very affordable price—the MX-80 is a genuine bargain. □

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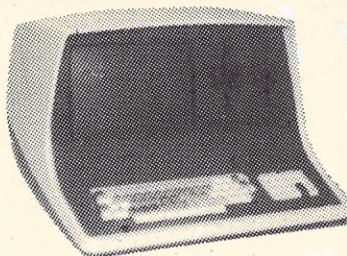


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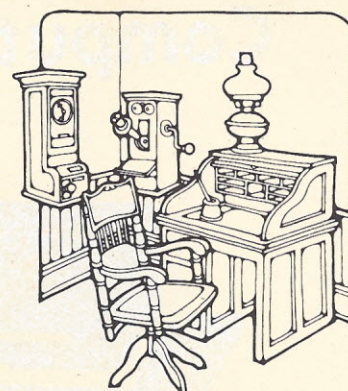


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## CMOS

4000	.37	4022	1.29	4047	1.75	4082	.35
4001	.29	4023	.37	4048	.79	4098	1.90
4002	.34	4024	.84	4049	.67	4099	2.19
4006	1.35	4025	.38	4050	.69	4502	1.57
4007	.24	4026	1.94	4051	1.05	4503	.90
4008	1.19	4027	.79	4052	1.09	4508	3.79
4009	.57	4028	.99	4053	1.09	4511	1.39
4010	.54	4029	1.19	4066	.79	4512	1.49
4011	.32	4030	.49	4069	.39	4515	2.99
4012	.34	4032	1.99	4070	1.39	4516	1.29
4013	.59	4035	1.19	4071	.39	4518	1.39
4014	1.05	4040	1.19	4072	.35	4519	1.37
4015	.99	4041	1.05	4073	.35	4520	1.39
4016	.57	4042	.99	4075	.35	4526	1.97
4017	1.04	4043	.99	4076	1.97	4528	1.49
4018	1.15	4044	.99	4077	.39		
4019	.49	4045	1.49	4078	.49		
4021	1.37	4046	1.79	4081	.35		

## Miscellaneous

MM58167	10.50	75189	1.49	8T93	1.99	8T98	1.95
75150	1.90	82S10	1.90	8T95	1.95	AY5-1013A	5.49
75188	1.49	8T28	2.49	8T96	1.95	AY5-2376	18.75

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10 Bags of 100 ..... 15.00	10 Bags of 100 ..... 16.00

## PIHER Trim Pots - Linear

	1-9	10-49	50-99
PT10V Top Adj.	.29	.25	.23
PT10H Side Adj.	.29	.25	.23
PT15 Thumbwheel	.39	.34	.30

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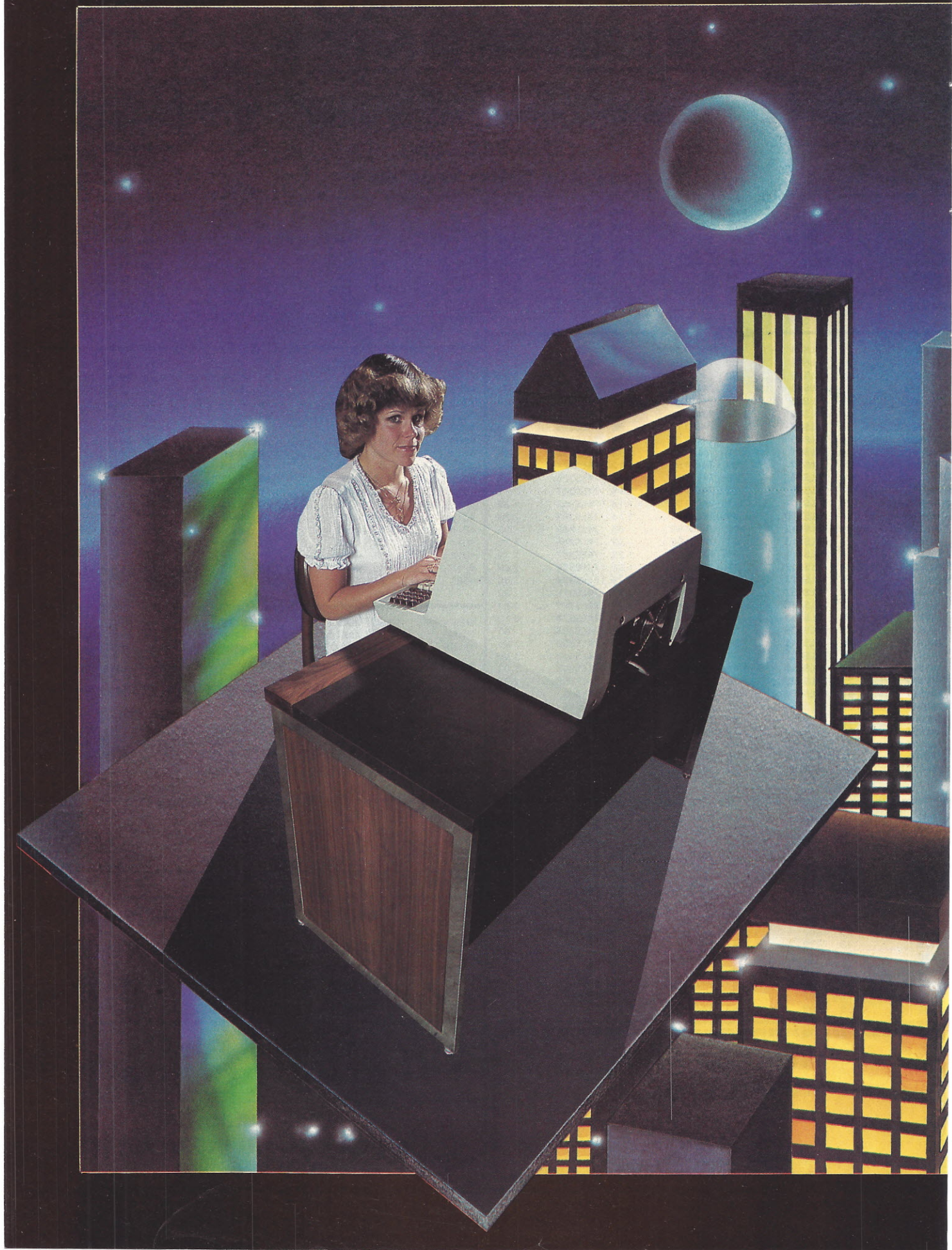
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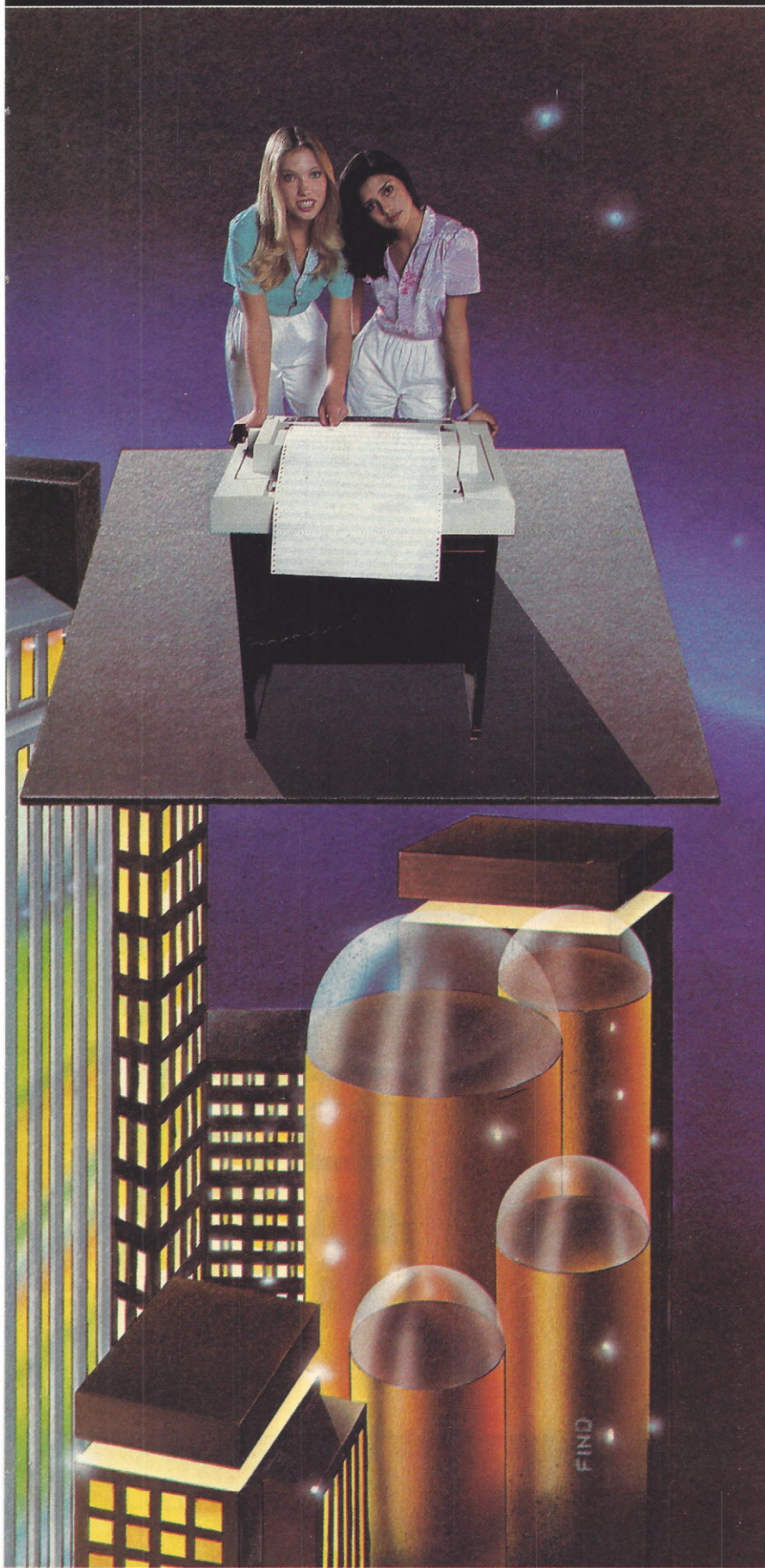
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## THE FUTURE OF DATA COMMUNICATIONS

by Bernard Conrad Cole

During the next few years, millions of computer terminals will dot the distributed processing environment, all tying into tens of thousands of interconnected computers in hundreds of different commercial, industrial, governmental and educational networks.

The needed links between widely dispersed equipment and data bases will be provided at first by programmable multifunction and multi-protocol information resource management terminals. They will be successors to today's mainframe-dependent and protocol specific "dumb" and "smart" terminals, as well as the more recently developed personal computers.

Unlike these earlier generation units, new multi-protocol terminals can, under user control, "talk" in any one of a number of communications protocols. Eventually, with the introduction of high performance 16 bit microprocessors, high density RAMs, and new specialized peripheral ICs to the design of such terminals,



they will be succeeded by sophisticated information stations. The means of communication will be completely transparent to the user: The system will automatically recognize what is coming over the transmission line, catalog the protocol and switch into that mode.

How far away are such stations? To determine that, it is necessary to review the requirements of the various data processing environments within which terminals must operate.

The present distributed processing environment is confusing, not only in the variety of network control architectures, but in transmission systems and technologies, data communication software, processor

## Physical interfaces are about the only level at which there is some universal agreement.

configurations, network architectures, processor configurations and hardware requirements.

The confusion is most obvious when one looks at the network control architectural options that are available to the user—whether he wants them or not—in which there are a variety of choices that must be made at various protocol levels.

Physical interfaces are about the only level at which there is some universal agreement. Most manufacturers agreed on the RS232C for modulator/demodulator (modem) interconnections between data terminal equipment and data communications equipment. But, even here, there are some variations.

The RS232C also defines electrical interface requirements, but there are a number of new options available also, including RS422 and RS423, to name a few. Outside the U.S. are the CCITT telecom standards.

In most terminals, such modem interconnections are handled automatically via software or firmware (for example, D.C. Hayes and Micromodem).

Data link protocols are at the next level, including asynchronous protocols such as Teletype and IBM 2740; synchronous character oriented protocols; binary synchronous character oriented protocols; synchronous bit-oriented protocols such as SDLC, ADCCP, HDLC, X.25, BDLC, BOLD and CDCCP; and synchronous/asynchronous byte-oriented protocols such as DDCMP, NSP and DAP.

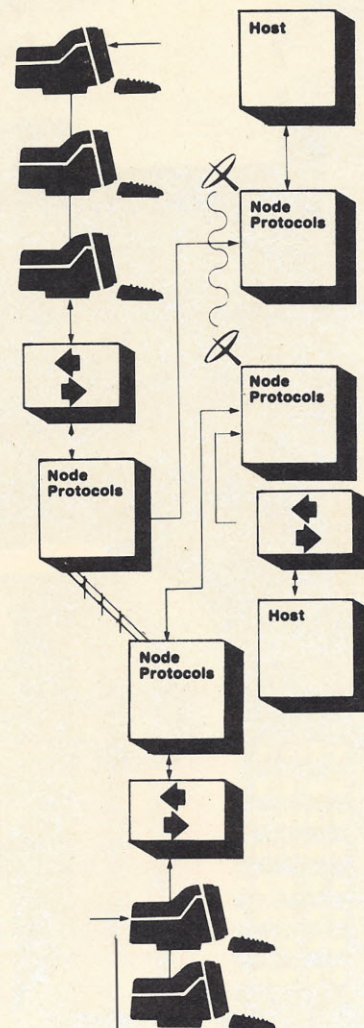
Within each single protocol are a number of sub-protocols, corresponding to the levels or layers in various network architectures.

The variety of transmission systems and technologies is almost as confusing as the number of protocols. The most common transmission systems, but by no means the only ones, are common carrier microwave networks, value added common carriers and satellite networks. And each uses a variety of transmission technologies, including: voice-grade telephone lines, private lines, terrestrial microwave radio, satellite technology, millimetric waveguides and optical fibers.

There are also a variety of network structure types the data communications user must contend with, including the hierarchical, star, ring and multistar or starred ring approaches.

In terms of software, there are at least two levels users must contend with: the operating system and the communications based access software.

**Networking Information**  
Stations total protocol flexibility coupled with local power and storage extend the advantages of networking even further with plug-in, fully compatible local/remote capabilities.



There are as many operating systems as there are CPUs, varying in scope from large scale systems for general purpose mainframe computers to specialized systems for minicomputers.

Associated with each operating system are a variety of communications based access software modules. For IBM mainframes alone, there are at least three:



BTAM, the basic telecomm access method; TCAM, the standard telecomm access method, and VTAM, the virtual telecomm access method. This proliferation of protocols and interfacing requirements is continuing, with new procedures introduced with each new CPU. This is hardly an environment conducive to distributed data base use.

The way we use computers and the way computers communicate with one another is undergoing a revolution of unprecedented proportions. We are just seeing the beginning of this revolution as the decade opens.

Playing a pivotal role in this transformation will be sophisticated multi-function, multiprotocol information stations, successors to today's intelligent programmable terminals and beneficiaries of the many advances in very large scale integration and micro-computer design.

Using such desk-sized, and eventually desktop, information stations—equivalent in power to many of yesterday's mainframes and today's minicomputers—the present top-down mainframe and hierarchically oriented distributed processing environment will be replaced. In its place will be dispersed processing networks, bottom-up structures in which the processing capability is dispersed among many nodes, equally accessible to all. In many respects, this dispersed processing environment will resemble the standard voice telephone or the electric power utility.

Today, with the telephone, a user has only to dial a code, and he is put in virtually instantaneous communication with any other human being on the planet, via a series of inter-related national telephone networks. Unlike present hierarchical structures, the means by which the communication is established is not the telephone user's concern. In other words, in the present dispersed telephone communications environment, the interactions between various destinations are transparent to the user.

Or to use the electric utility analogy, any user today can instantly obtain the electric power he needs without worrying about where it comes from.

In such a dispersed processing environment, users will connect themselves to one another directly; files will tend to accumulate in one place or another when reason or profit dictate it. With the numerous protocols and procedures that typify the present mainframe-dominated distributed processing environment removed as stumbling blocks, the centralized uniprocessor approach to computing will be replaced by a multiprocessing scheme in which the various information station nodes act in concert to solve the problems at hand.

### **Social factors**

Although such a dispersed processing environment works against the economic interests of the mainframe manufacturers who control the present hierarchically oriented distributed processing structures, there are social and technological factors that are a match for the force of their institutional momentum.

On the social side, there are an increasing number of small users who: 1) want greater access to the information contained in the numerous separate data bases that already exist; 2) want greater computing power at lower cost; and 3) want software that is non-invasive, which makes relations between them and the network more friendly.

Fortunately, on the technological side, there are forces at work that oppose the top-down structure of the present distributed processing architecture and favor the development of the bottom-up dispersed processing environment of the future.

Initially the solutions are only partial ones—systems incorporating some elements of the dispersed processing solution. These user programmable terminals are available now from a variety of firms, including Applied Digital Data Systems, Codex, Datapoint, Digi-Log, Four Phase, Incoterm, Sycor, Ontel, Ramtek, Raytheon and Zentec.

These systems, however, have two drawbacks: one relates to the way they are marketed and the other

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## **The present top-down mainframe and hierarchically oriented environment will be replaced.**

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technological. In terms of marketing, few, if any, are aimed at the standalone market. Most are aimed at emulating the terminals used in various mainframe-oriented hierarchical networks. Even those with cluster capability are still tied in one way or another to a specific CPU or network. And as far as technology goes, while each have some elements of multiprotocol solution, few incorporate all of the same elements.

A more complete solution would be to combine all the elements into a single multifunction, multi-protocol information resource management terminal, such as the ECS Microsystems' 4500 series.

Unlike the limited data processing function terminals just discussed, advance terminal designs, such as the 4500, can support all major mainframe protocols and can be used in a variety of configurations, including: standalone data processing; distributed processing (functional and hierarchical); network operation (ring, star and string); and point-to-point communications.

Many of these same approaches are working their way into design of future personal computer systems based on the new 16 bit microprocessors. Indeed, as component technology grows more sophisticated, the distinction between a terminal and/or information station and what is now referred to as personal computers will soon disappear.

Many of the limits on the ability of present multiprotocol information terminals can be overcome with the use of a processor of sufficient power.

Present terminal and personal computer configurations based on 8 bit CPUs such as the Z80, 8080, 8085, 6502 and 6800 require extensive upgrading to match needed specifications. However, recent developments in 16 bit microprocessor design are approaching the basic functional features assumed here.

In the dispersed processing environment, there is also the problem of memory. Because local memory is usually connected to the specific terminal CPU via a dedicated bus link, contention usually occurs in relation





to the global memory. It is apparent that as the number of global memory accesses (terminals) increases, contention increases and throughput decreases.

As memory prices drop and new high density devices (such as 64K and 256K bit NMOS dynamic RAMs and 256K, 512K, 1M and 4M bit bubble memories) come into production, replication of global memory programs can be replicated throughout local memories, rather than single copies in global memory, thus eliminating a major source of contention.

Present devices and tomorrow's information stations will require more than just powerful CPUs and denser memory to meet the required specifications. A key deficiency is in the lack of protocol transparency; that is, operator intervention is required to select protocols.

Until recently, few computer systems, let alone terminals, have had this feature. The exception to this is in some large front end communications processors where multiple protocols are supported, such as Univac's distributed communications processor. These large units are the start of automatic protocol recognition. They, however, are limited to specified port allocations and function as large switchboards to the host.

This, however, is a different activity from the one a terminal performs. The terminal must recognize a number of protocols sent to it from a number of different hosts. Along these same lines, in sending data to a host, the terminal must recognize or know the hosts' protocol. The protocol can be deciphered in the handshake routines providing that the host responds in a non-ambiguous manner or does not disconnect before the analysis has completed its task. The technique for this function is similar to decoding in the intelligence com-

munity. This is essentially a pattern matching procedure and can be adapted to terminal designs by building on top of the existing operating system software, or, building a completely new system with portions of the multiprotocol capability made available in hardware.

Implementing protocol transparency into a terminal using software techniques is fraught with difficulties. Although they are sufficiently similar in format to allow much commonality in software, they are not interchangeable. Control and response code differences exist, for one thing. Also, the different bit oriented protocols may not share the same classes of procedures. These classes establish procedural differences for different applications. Each class implements a subset of the elements of procedure. All classes use the standard frame structure, however. Nonetheless, ANSI has defined six classes covering normal, asynchronous, and primary-to-primary nodes. ISO has five classes covering the same basic applications.

The other problem with the software approach relates to the fact that protocol layer implementation is very performance-sensitive. If, for example, lower level protocols are implemented in a way resulting in excessive operating system overhead, total system performance will degrade. However, if lower level functions, such as data link and end-to-end data transfer control, are removed from the various protocol layers and imbedded in the operating system in order to improve total system performance, the clarity and flexibility associated with the strict hierarchical layering will be lost.

Fortunately, significant activity has taken place in terms of incorporating data link control protocols into hardware, either into separate microprocessors, or into data link control ICs. As a result, the next generation successors to today's programmable information resource management terminals will see much of the software supported data link control function taken over by hardware.

Most are programmable and can thus support more than one data link protocol. Also, some of these chips can support data rates up to 2 million bits per second and several protocols such as Bisync and DDCMP. In addition, features such as modem control for point-to-point communications, loop back for self test, secondary address comparison and global address recognition have been incorporated into several of these chips.

### Other protocols needed

As discussed earlier, data link protocols satisfy only one level of the problem. They are not a network protocol, nor do they control the flow of information between users in a multinodal network.

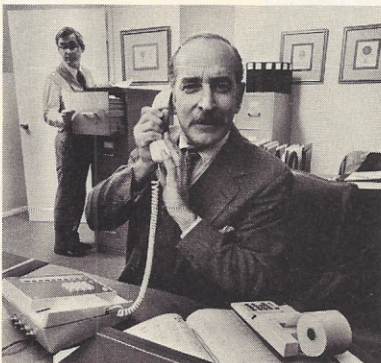
Mechanisms to unravel these additional layers are in development. The ultimate solution will be neither totally software nor hardware dependent, but some combination.

Incorporated into the multifunction, multiprotocol information stations of the near future, these solutions will result in all data handling capabilities concentrated into one local unit, providing both local transaction capability and access to all system functions. As a result, an entirely new type of distributed processing network environment will evolve—a network optimized for information base management functions based on multifunction, multiprotocol information stations. □





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### The knowledge business









# QUICK REGISTER

by Chuck Atkinson

Computers are being used to replace manual inventory control systems and the benefits are becoming well known. The sales information and invoices for shipments received are keyed in at the end of each sales period and the computer takes it from there. The sales tickets are still handwritten, however, resulting in the same information being manually processed twice for each sale.

New systems in some large grocery stores use a laser pen to read the code on each item. It is amazing to watch as the price and description are recalled almost instantly and added to the list of purchases. While this is obvious to the customer, the computer, somewhere out of sight, is also adjusting the inventory simultaneously. If a system like this was inexpensive, every retailer would have one, but it is out of the price range for most small businesses.

The following program will print the sales ticket and post the sales to the inventory at the same instant. It will run on a low cost microcomputer in CBasic and CP/M.

You enter the quantity and part number for the items as they are sold. The computer will then: find the item in the inventory; retrieve the current price; multiply the quantity sold by the price; total all items sold on the ticket; calculate the sales tax; add the sales tax to the total; show the grand total; print the sales ticket; reduce

the quantity on hand by the number sold; increase the sales totals and prepare a daily sales summary.

This cuts the manual effort in half and gives you and the customer a printed copy of the sales ticket that contains a lot more information.

Start the program by entering CRUN QUICK1. The display will ask you if you want to erase the daily sales file (figure 1). Erase it at the beginning of the day, so a sales report can be run at the end of the day containing only the activity for the day.

Next, enter the date. This will be printed at the top of all sales tickets and reports.

The table of operations will then appear (figure 2). Select S to sell items, R to review the sales and END to conclude the program. That's all there is to it. A sample sales receipt is shown in figure 3.

Follow the step-by-step entering of the quantity and part number for each item sold (figure 4), in response to the questions on the display. (The questions are displayed only, during normal operation. They are printed here to aid the explanation.) Entering 0 signals the computer that there are no more items on this sale. The information you entered will be displayed and you can make changes until you enter N for no more changes. The option will now be given to you for a printed copy or display only (figure 5).

```
CRUN QUICK1
```

```
CRUN VER 1.03
```

```
ERASE THE DAILY FILE AT THE START OF EACH DAY.
```

```
DO YOU WANT TO ERASE THE DAILY SALES FILE ? Y = YES, N = NO. _Y_
```

```
TODAY'S DATE? 12-11-1980
```

Figure 1. Starting the QUICK1 program



S = SALES RECEIPT

R = REVIEW TODAY'S SALES

END = END OF RUN

SELECT ACTION FROM TABLE ABOVE S  
---**Figure 2. Table of operations**

The completed sales receipt has the sales ticket number from the file TICKET#, the name and address from the file VENDOR, the quantity, part number, description and price for each item. The extended total for each line is printed in the far right hand column. This column is totalled at the bottom and sales tax is added to produce the grand total for the sale. The remarks from the VENDOR file are printed at the bottom.

The TICKET# file keeps track of the tickets and the value in the file is increased by one after each grand total.

The name and address, remarks and tax rate come from the VENDOR file. This information can be easily changed with your editor if it becomes necessary. The program remains the same.

Select R from the table of operations to review the sales for the day (figure 6). The complete information for each part sold is printed, along with the grand total and the sales tax. This should correspond to the increase in the cash in the register for the day. Select END to exit the program. Warnings will be displayed

about back up files and removing disks from the drives before turning off the power.

The files PART, INDEX, TICKET # and VENDOR are shown in figure 7. They are constructed as follows:

File	Record Length	Variables
PART	80	P\$, L\$, D\$, V\$, N, R, OH, MN, MX, OO, S, YT
INDEX	18	P, K
TICKET#	15	SI
VENDOR	150	NAM\$, SR\$, CTY\$, ST\$, Z\$, PH\$, RMK\$, TAX

The variable explanations are listed below:

Variable Definition	
P\$	Part number
L\$	Location
D\$	Description
V\$	Vendor code

SALES INVOICE # 10

12-11-1980

SAILING CENTER  
LAKEVIEW DRIVE BENBROOK, TEXAS 76126  
(888) 222-1234

ITEM #	QUANTITY	PART NUMBER	DESCRIPTION	PRICE	TOTAL
1	2	1010000	GUDGEON	3.5	7
2	1	1053050	TILLER X HNG	5.5	5.5
3	3	1009200	DRAIN PLUG GASK	1.05	3.15
4	2	1050300	BALL 1 7/8	6.5	13
5	1	1026000	CLEAT JAM	1.65	1.65
6	5	1047050	CAM	3.98	19.9
7	2	1046050	RUDDER LOCK KIT	2.75	5.5
				TOTAL	\$55.70
				TAX	\$2.79
				TOTAL	\$58.49

SAILBOATS AND SUPPLIES

**Figure 3. Sample sales invoice (receipt)**

Continued on page 146



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# The Video Display Revolution

by Larry C. Raymond

The need for low-cost, alphanumeric video display terminals has never been greater. With the use of computers increasing at a staggering rate, the demand for devices that allow man to communicate with his computer is tremendous.

There are many ways that such communication can be accomplished. At one point the front panel, an array of paddle switches and indicator lights, was the primary device. Later, the electro-mechanical printing terminal became common.

Today there is a new standard. With the advent of medium and large scale integrated circuit technologies (specifically the microprocessor chip), versatile and powerful video display terminals became available. These provided the computer operator with an alternative to the printing terminal, featuring improved reliability, a reduction in noise levels and a competitive price.

Today, the video display terminal is available in numerous styles, designed to fulfill a broad range of needs. Virtually all of them consist of four basic function modules: the monitor, for the display of characters; the keyboard, for the entry of





**Table 1. Display terminal specifications**

Manufacturer	Model Number	Suggested Retail Price	Size (Dimension and Weight)	Screen (Size and Type)	Characters Displayed (Total and Columns by Rows)	Character Set (Number of Displayable Characters)
ADDS Applied Digital Data Systems, Inc. 100 Marcus Blvd. Liauppauge, NY 11787	Regent 20	\$ 995	15" x 14" x 13.5" 33 lbs.	12" diag.	1920 80 x 24	128
	Regent 25	\$1,095	18.5" x 15" x 23" 38 lbs.	12" diag.	1920 80 x 24	128
Ampex Corporation 401 Broadway Redwood City, CA 94063	Dialogue 80	\$1,149	33 lbs.	12" diag. P4 white	1920 80 x 24	96
Amtek Business Machines, Inc. 2255 H Martin Ave. Santa Clara, CA 95050	ABM 80	n/a	13.6" x 14.8" x 22.5" 32 lbs.	12" diag. P31 green	1920 80 x 24	128
Beehive International 4910 Amelia Earhart Dr. Box 25668 Salt Lake City, UT 84125	DM10	n/a	18" x 13" x 22.5" 43 lbs.	12" diag.	1920 80 x 24	128
	DM1A	\$1,395	18" x 13" x 22.5" 43 lbs.	12" diag.	1920 80 x 24	128
COPS Computer Peripheral Corporation 1225 Connecticut Ave. Bridgeport, CT 06607	COPS 10	n/a	16.6" x 20.6" x 13.6" 48 lbs.	12" diag. non-glare	1920 80 x 24	n/a
Datamedia Corporation 7401 Central Highway Pennsauken, NJ 08110	Elite 1521	\$1,295— \$1,695	18" x 15" x 23" 39 lbs.	n/a	1920 80 x 24	128
GDS, Inc. Garyco Data Systems, Inc. 1911 22nd Ave. So. Seattle, WA 98144	132/C Displaymaster	\$1,795— \$2,220	15.5" x 19" x 23" 42 lbs.	13" x 7" P31 green	3960* 132 x 30*	n/a
GTC General Terminal Corporation 14831 Franklin Ave. Tustin, CA 92680	GT-101	\$1,095	14" x 17.5" x 22.5" 45 lbs.	12" diag. P4 white	1920 80 x 24	128
	GT-110	\$1,249	14" x 17.5" x 22.5" 45 lbs.	12" P4 white	1920 80 x 24	128
Hazeltine Corporation Greenlawn, NY 11740	1410	\$ 900	15.5" x 13.5" x 20.5" 26 lbs.	6" x 9"	1920 80 x 24	128
	1420	\$ 995	15.5" x 13.5" x 20.5" 26 lbs.	6" x 9"	1920 80 x 24	128
	1500 Series	\$1,225— \$1,650	15.5" x 13.5" x 20.5" 35 lbs.	6" x 9"	1920 80 x 24	128
HDS Human Designed Systems, Inc. 3700 Market St. Philadelphia, PA 19104	Concept 100	\$1,575— \$1,855	17.5" x 3" x 8.75" (keyboard) 15" x 16" x 16.5" (monitor)	12" diag. P4 white	1920 80 x 24	128
Heath Company Benton Harbor, MI 49022	WH-19	\$675 (kit) \$ 995	13" x 17" x 20" 49 lbs.	12" diag. P4 white	1920 80 x 24	n/a
Hewlett-Packard 19400 Homestead Rd. Cupertino, CA 95014	2621A	\$1,495	35.5 lbs.	6" x 8.5" P4 white	1920 80 x 24	n/a
Informer, Inc. 8332 Osage Ave. Los Angeles, CA 90045	D301	\$1,595	24.5" x 21.5" x 6" 10 lbs.	n/a	512 32 x 16	64 96 opt.
IDS Intertec Data Systems Corporation 2300 Broad River Rd. Columbia, SC 29210	Intertube	\$ 995	14.6" x 21.4" x 23" 34 lbs.	12" diag. P4 white	1920 80 x 24	n/a
LSI Lear Siegler, Inc. 714 N. Brookhurst St. Anaheim, CA 92803	ADM-3A	\$ 895	15.5" x 13.5" x 19" 25 lbs.	12" diag.	1920 80 x 24	64
	ADM-5	\$ 995	n/a	12" diag.	1920 80 x 24	n/a



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```
LINE 1 SALES = 100 200 300 400
LINE 2 EXP = GROW 50 BY 15%
LINE 3 NET = SALES - EXP
```

#### Their Product on Their System. . .

```
SALES 100 200 300 400
EXP 50 + B2*1.15 + C2*1 + D2*1.15
NET + B1-B2 + C1-C2 + D1-D2 + E1-E2
```

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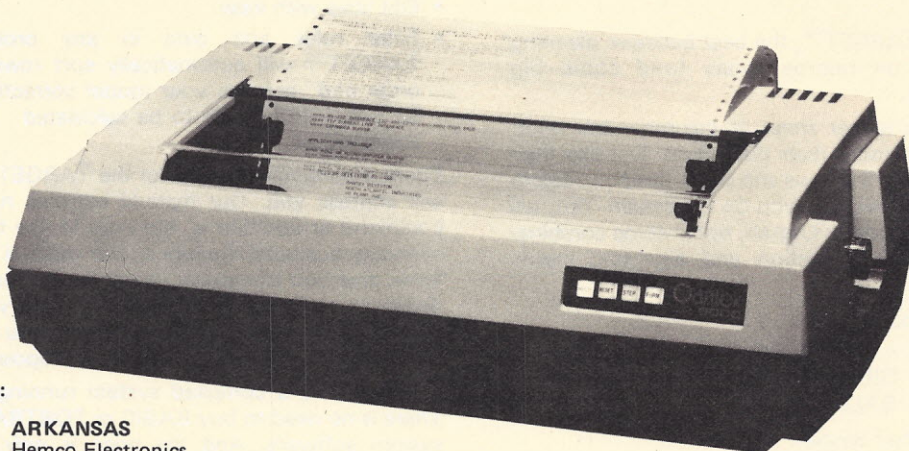
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**Table 1. Display terminal specifications (continued)**

Manufacturer	Model Number	Suggested Retail Price	Size (Dimension and Weight)	Screen (Size and Type)	Characters Displayed (Total and Columns by Rows)	Character Set (Number of Displayable Characters)
MAS Micro Application Systems 5575 N. Cty. Rd. 18 Minneapolis, MN 55442	MINI MAS 1	\$ 777	14" x 12" x 18" 22 lbs.	12" diag. P4 white	1920 80 x 24	128
	MINI MAS 2	\$ 888	14" x 12" x 18" 22 lbs.	12" diag. P4 white	1920* 80* x 24	128
Micro-Term, Inc. 1314 Hanley Industrial Court St. Louis, MO 63144	ACT5-A	\$ 945	17" x 23" x 15" 37 lbs.	12" diag. P4 white nonglare	1920* 80 x 24*	128
Perkin-Elmer Main Ave. Norwalk, CT 06856	550	\$ 966	14" x 15" x 19" 30 lbs.	12" diag. P4 white	1920 80 x 24	128
Soroc Technology, Inc. 165 Freedom Ave. Anaheim, CA 92801	IQ 120	\$ 995	25.5" x 18" x 21" 45 lbs.	12" diag. P4 white nonglare	1920 80 x 24	96
	IQ 135	n/a	18" x 13" x 20.5" 45 lbs.	12" diag. nonglare	1920 80 x 24	128
	IQ 140	\$1,495	20" x 13.5" x 23.5" 50 lbs.	12" diag. P4 white nonglare	1920 80 x 24	
Teleray Division of Research Inc. Box 24064 Minneapolis, MN 55424	10	\$1,190— \$1,285	28.5—36 lbs.	12" diag. P4 white nonglare	1920* 80 x 24*	
	12	\$1,690	28.5—35.5 lbs.	12" diag. P4 white nonglare	1920* 80 x 24*	128
Televideo, Inc. 2149 Paragon Dr. San Jose, CA 95131	TVI 912C	\$ 950— \$1,030	16" x 13" x 20" 30 lbs.	12" diag.	1920 80 x 24	128
Texas Instruments, Inc. P.O. Box 1444 Houston, TX 77001	OPTI 940	\$1,895	n/a	12" diag.	1920* (standard) 80 x 24	128
Zentec Corporation 2400 Walsh Ave. Santa Clara, CA 95050	Zephyr	\$1,350	18" x 13" x 22" 50 lbs.	12" diag. P4 nonglare	1920 80 x 24	128
n/a = information not available * = maximum						

character data; the control unit, for the manipulation and display of characters; and the communications module, providing circuits required to send and receive data. But, these modules encompass a broad range of implementations.

There are terminals designed for displaying high-resolution graphic images. There are mini-terminals with limited display and keyboard capabilities for special purposes. There are models for data entry and others intended for data communications (remote) applications.

Our focus in the accompanying comparative evaluation is on yet another variety—alphanumeric display terminals—those capable of being used in a variety of applications and interfacing with a variety of digital computers.

For our purposes, certain selection criteria were established.

The first requirement is that all terminals implement the RS232 communications interface standard, although many support additional communications methods. This

standard has been widely implemented by manufacturers and guarantees electrical capability between the computer and the display terminal.

All terminals listed utilize the ASCII standard coded characters to communicate with the host computer. This guarantees logical compatibility between the computer and the terminal.

The third requirement was for all terminals to be capable of displaying a full complement of alphabetic and numeric characters, punctuation symbols, mathematical symbols, etc. This is necessary to assure that the terminal is adequate for computer operations and that it is capable of being used with an assortment of software. All terminals listed have typewriter-type keyboards, as a minimum, although many provide numeric keypads and special function keys also.

The last criterion is in regard to cost. The terminals included represent the low end of the price scale of the alphanumeric video display terminal market. There are the "dumber" terminals; but this is not to say that



**Table 2. Display terminal features**

Manufacturer	Model Number	Selected Features								Transmission Modes	Transmission Speed (Baud)	Other Features
		Cursor Control	Reverse Video	Blinking Fields	Blank Fields	Alarm (Bell)	Automatic Repeat Characters	Upper and Lower Case Characters	Self Test			
ADDs	Regent 20	no	yes	yes	no	yes	yes	yes	no	character	110-9.6K	Numeric keypad
	Regent 25	yes	yes	yes	no	yes	yes	yes	no	character	110-9.6K	Monitor mode
Ampex	Dialogue 80	yes	yes	yes	yes	n/a	yes	yes	yes	character, block	50-19.2K	Detachable keyboard, Numeric keypad
Amtek	ABM 80	yes	yes	no	no	yes	yes	yes	yes	character, block	110-9.6K	
Beehive	DM10	yes	yes	n/a	n/a	yes	n/a	n/a	n/a	n/a	110-19.2K	Monitor mode
	DM1A	yes	yes	yes	no	yes	yes	yes	yes	character	110-19.2K	Graphics characters, Time-of-day clock
COPS	COPS 10	yes	no	no	no	yes	yes	yes	no	character	110-19.2K	Detachable keyboard
Datamedia	Elite 1521	yes	no	no	no	yes	no	no	n/a	character	110-9.6K	Status line
GDS	132/C Displaymaster	yes	yes	n/a	n/a	yes	yes	yes	yes	character	up to 19.2K	Programmable function keys, Line drawings
GTC	GT-101	yes	yes	no	no	yes	yes	yes	yes	character, block	110-19.2K	Status line, Line drawings
	GT-110	yes	yes	yes	yes	yes	yes	yes	yes	character, block	110-19.2K	Status line, Block graphics
Hazeltine	1410	yes	no	no	no	no	no	no	yes	character	up to 9.6K	Numeric keypad
	1420	yes	no	yes	yes	yes	yes	yes	yes	character	up to 9.6K	Numeric keypad
	1500 Series	yes	yes	no	no	yes	yes	yes	yes	character, block	up to 19.2K	function keys
HDS	Concept 100	yes	yes	yes	yes	n/a	yes	yes	n/a	character, block	50-9.6K	Business graphics, Windowing, Tilt screen
Heath	WH-19	yes	yes	n/a	n/a	yes	n/a	yes	n/a	character	110-9.6K	Status line
Hewlett-Packard	2621A	yes	yes	yes	no	yes	yes	yes	yes	character	110-9.6K	2-page memory, detachable keyboard
Informer, Inc.	D301	yes	no	yes	no	yes	no	no	no	character	up to 9.6K	Separate control unit
IDS	Intertube	yes	yes	yes	n/a	yes	yes	yes	yes	character, block	50-9.6K	
LSI	ADM-3A	yes	no	no	no	yes	yes	no	no	character, block	75-19.2K	
	ADM-5	yes	yes	no	no	yes	yes	yes	n/a	character, block	up to 19.2K	Status line
MAS	MINI MAS 1	yes	yes	yes	yes	yes	yes	yes	no	character, block	up to 9.6K	Numeric keypad
	MINI MAS 2	yes	yes	yes	yes	yes	yes	yes	yes	character, block	up to 19.2K	Numeric keypad
Microterm	ACT5-A	yes	yes	yes	no	yes	yes	yes	no	character, block	110-19.2K	Graphics set
Perkin-Elmer	550	yes	n/a	no	no	yes	yes	yes	yes	character	110-9.6K	Optional character sets
Soroc	IQ 120	yes	no	no	no	yes	yes	yes	no	character, block	75-19.2K	
	IQ 135	yes	yes	yes	n/a	yes	yes	yes	no	character, block	110-19.2K	Status line, Line graphics
	IQ 140	yes	yes	yes	yes	yes	yes	yes	no	character, block	110-19.2K	Detachable keyboard, Numeric keypad
Teleray	10	yes	yes	yes	yes	yes	yes	yes	no	character, block	50-9.6K	Double-wide characters 4 styles, some w/detachable keypad
	12	yes	yes	yes	yes	yes	yes	yes	no	character, block	50-9.6K	2-page memory, 3 styles Numeric keypad, 128-character buffer
Televideo	TVI 912C	yes	yes	yes	yes	yes	yes	yes	yes	character, block	75-9.6K	Numeric keypad, Function keys
Texas Instruments	OPTI 940	yes	yes	yes	yes	yes	yes	yes	yes	character, block	110-19.2K	Tilttable display, Detachable keyboard, Programmable function keys
Zentec	Zephyr	yes	yes	yes	yes	yes	yes	yes	yes	character, block	110-19.2K	Numeric keypad, Status line

n/a = information not available



these terminals are not very capable and versatile. In fact, there are very few truly "dumb" terminals available today. The trend has been for manufacturers, mainly through the use of microprocessors, to provide editing and data highlighting "smarts" heretofore found only in higher priced models.

The accompanying charts have been provided to give the reader an overview of what is currently available. The tables neither approve of a particular terminal by listing it, nor disapprove of another by not listing it. The tables merely portray a cross-section of terminals meeting the selection criteria.

The first four columns of table 1 are basically self-explanatory, providing information on the manufacturer's name and address, the model(s) represented, the suggested retail price, and the size and weight.

### Display screen columns

The next three columns pertain to the display screen. The dimension is given along with the type—when information was available. The screen type has been an area of change for video terminals in the last few years. Although the cost for applications involving extended periods of use is generally greater, it has been found that the green phosphor type screen causes less eye strain. The next column describes the capacity of the screen in terms of the total number of characters displayed at one time. Below, within the same column, is a breakdown of how many characters are displayed per line or row on the screen by how many lines are on a screen. The "character set" column indicates the terminal's capacity to display different characters.

Some terminals can display only upper case alpha characters, others display upper and lower case, some display more special characters (mathematical symbols, financial symbols, etc.) than others. These are all factors to consider in choosing the best terminal to suit your needs.

### Additional features

In table 2, the group of columns entitled Selected Features depict some basic video and functional features—the "smarts" of the terminal. Although all may not be necessary for some applications, they can provide the user/programmer with a much more versatile tool. Most categories are self-explanatory, ranging from video attributes to certain functional attributes. Yes or no indicates the presence or absence of the feature.

The next two columns concern the terminals' communications features. Although all use the RS232 standard, there can be varying capabilities. The speed at which the terminal can send and receive information is a selection factor. This is indicated as the baud rate—a rating system basically equivalent to the number of bits being transmitted per second. Also to be considered is the ability for various transmission modes. All terminals listed are capable of character by character transmission.

The final column is sort of a catch-all—a place to indicate some of the additional features or unique amenities of a particular terminal. Due to space limitations, all features of a particular terminal cannot be listed. □

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# Local Packet Networking

by Bernard Conrad Cole

An unforeseen byproduct of the proliferation of low cost computing power within many major corporations and organizations is an increasingly severe data communications problem. What many organizations are ending up with is a multitude of various terminals, word processors, personal computers and small business computers, as well as mainframe computers that cannot talk to each other.

In most large corporations, it is useful to have intercommunication among computer and/or terminal. So, there is a movement afoot to begin to network resources that are already available.

Many of these network schemes are limited technically to servicing 1-2 room areas, mostly buildings. Even with this limitation, there are several markets to be satisfied, although this approach does not allow much room for expansion. One is the automation of the office, which usually involves facilitating the ability of microprocessor-based word processors to communicate. The other is extending the capacity of existing terminal-mainframe configurations beyond what is allowed with current hardwired baseband coaxial systems. This will permit them to talk to more than just the device that is hardwired on.

Most colleges, universities and schools that have campus configurations ideal for local networks also fall into this category. In the financial districts of most cities, there are banks, brokerages, and transaction facilities with hundreds of people using terminal devices invariably connected to some kind of network.

Until recently, the only alternative that a major organization had if it wanted to hook its computing and terminal facilities together into a local network was PABX telephone switching technology. But this has a number of drawbacks.

First is the long time it takes to connect a call—often 20 seconds or more. In many potential computer and terminal applications, when a terminal or computer needs data it needs it fast, and the prospects of a 20-second wait each time rules out the use of telephone switching.

Second, in many uses of computers, the transmission of data is sporadic. For example, a response is sent to a terminal. The terminal user thinks about it for awhile and then sends a brief message to the computer. A dialog proceeds in which the messages and responses are interspersed with substantial pauses. If the dialog is taking place over a switched public telephone line transmitting at 4800 baud, the gaps may be as much as 100 times longer than the times when data is actually being transmitted. If the connection could be switched and disconnected in a fraction of a second, the lines could be used more efficiently, but this is not the case with a PABX or public telephone network.

A third drawback is that blocking sometimes occurs on the network, and a call cannot be switched as required because all the registers in an exchange or all the circuits on a given route are occupied.

Because of these drawbacks, many companies are looking at the concept of packet communications, a technique originally developed for long distance computer communications (ARPANET, the prime example) and seeing how it can be applied to local computer communications.

Two chief advantages of the packet network approach are the ability to handle data rates in the 1K to 10M bps range and channel utilization approaching 90%, a very high efficiency by communications system standards. By comparison, the best voice grade telephone switching systems can achieve, even with the most advanced computerized PABX technology is between 19K and 56K bits per second.

An appropriately designed local packet network can improve on these drawbacks in that:

- There is no dialing and no call connect time. The only delay is the packet transit delay of a fraction of a second.
- When transmission is sporadic, packets are sent only when needed, and other users are not excluded from the trunk during idle periods.
- When all trunks are occupied, the caller is not rejected with a busy signal. Instead, the packet waits within a queue until a trunk becomes free—normally no more than a fraction of a second.

Compared to telephone circuit switching, the efficiency of this approach derives from the fact that a user sending data occupies the network for only the time it takes his packets to travel. In between, the network is free to accept packets from many other users. Aside from efficiency, packet switching has many other advantages, mostly from the built-in intelligence. The switches themselves are basically microcomputers and they can be programmed to do many functions. Error checking is a key function. Each packet of information is double checked each step of the way, resulting in a degree of accuracy on the network not obtainable before. The software in the system also allows users to undertake a number of communications processing functions—such as speed conversion—to allow terminals of different types to communicate effectively.

And by standardizing the packets and the methods of connecting terminals and computers to the network, a universal accessible network is possible, one that will accommodate many users with many different types of equipment.

Because of the interactive nature of the communications in most local networks, the virtual circuit approach



to handling the flow of packets is used. A virtual circuit is a logical point-to-point connection between the sending and receiving terminals. The virtual circuit is analogous to the real circuit that would be established through a circuit switching system, except that packet switching network resources are not permanently assigned to a particular virtual circuit. In a virtual circuit system, the packet switching network delivers packets in the order they were received by the network. It also takes responsibility for recovering lost packets and for not delivering duplicate packets.

A standard network access control has been adopted internationally as CCITT Recommendation X.28. This protocol defines procedures for setting up a call, transferring data, and clearing down the call after the data exchange is completed. It contains three levels of protocol.

Level 1 lays down the rules necessary to establish a physical link between the terminal or computer and the

packet switching network (PSN). Level 2 is a link access procedure that lays down the rules for passing information between the terminal or computer and the network. Level 3 establishes packet formats and the control procedures necessary to set up a call and exchange information with other terminals or computers.

Computers and intelligent terminals are capable of implementing such a protocol, so they can directly connect into the network. Dumb terminals need to be connected via an intelligent network access machine that satisfies the X.3 packet assembly/disassembly protocol. Such a device allows it to accept data from a terminal, packetize it, and forward it into the packet switching network via the standard protocol. The network then carries the data through to the receiving terminal or computer.

To implement this packet networking scheme, three basic media alternatives are being considered—baseband coaxial, broadband coaxial and optical fibers.

## PABX Still in the Ballpark

With literally billions of dollars at stake, the telephone-switch based PABX manufacturers are not giving up the local computer communications market without a fight.

The chief advantage they have is that literally millions of miles of installed twisted wire already exist. And many PABX manufacturers have developed technological "fixes" to alleviate some of the limitations of the traditional telephone switching network approach. This allows communication between computers and terminals, using packet switching techniques similar to the Ethernet approach.

The companies expected to enter the market in a big way are Rolm Corp. of Santa Clara, CA; Datapoint Corp., San Antonio, TX; the Intercom division of Exxon, Dallas, TX; Harris Digital Telephone Systems, Novato, CA; and Lexar Corp., Los Angeles, CA.

Each of these firms has introduced (or soon will) PBXs integrating both voice and data from a single terminal location.

Typical of the approaches being considered by these firms is the system just introduced by Rolm Corp., a manufacturer of both military-type minicomputers and computerized PABXs (or CBXs, as they are designated). Using a technique called "submultiplexing", the system will allow voice and digital communications between terminals, computers and other facilities, on-site and off-site, at speeds as high as 19,200 bits per second for less than the per connection cost of a 1200 bps modem.

In submultiplexing, the slots used for a single voice grade telephone conversation can now be subdivided (or submultiplexed) to transmit 40 simultaneous, 2400 bps data connections through any Rolm CBX. In this enhancement of the CBX time division multiplexing process, all voice signals are digitized so that more than one two-way conversation can travel in the same time slot at 144,000 bps. Two of the CBX's 384 time slots are required for each voice transmission. With submultiplexing, the dedication of 16 time slots individually divided into 40 position fields provides as many as 640 data connections or 320 simultaneous full duplex connections.

All that an organization with a CBX already in place requires to implement the submultiplexing scheme is a new release of CBX software and three other components.

A data terminal interface (DTI), a desk top device that connects a terminal and the CBX, is the first. It can be used with any asynchronous terminal, computer port, modem, or multiplexer to transmit data over standard telephone wires at 110 bps to 19.2K bps at distances as far as 5,000 feet from the CBX. The DTI has a standard RS232C interface.

A data line interface (DLI), two pc boards mounted in the CBX cabinet, is also available. Each DLI supports 16 data lines and each channel operates at a data rate independent of the others. The DLI provides the interface and control capabilities for full duplex communications before connection to the time division multiplexing bus for switching by the CBX.

Finally, a time division multiplexing control card is installed in the CBX cabinet, to expand the traffic carrying capacity of the CBX, by submultiplexing the data connections.

The advantage of submultiplexing is that it removes what previously seemed to be a fixed limitation by effectively allocating parts of CBX time slots into voice or data portions, as needed. Although data communications need less time per connection than a voice call, the actual connect time, the percentage of lines used and the number of calls in progress at any time are greater for data calls.

Designed for facilities with 24 to 4000 extensions, the CBX provides a capability for as much as 74 million bps of data to accommodate a wide range of office automation applications.

Major markets for the submultiplexed voice/data Rolm CBX will be systems with 200 or more lines, but, according to the company, the approach will be cost-effective for systems with as few as four terminals.

—BCC



Coaxial cable, in general, is the most popular transmission medium for the non-optical approaches to local packet networking because of its moderate cost and ease of configuration as well as its relatively high bandwidth. Baseband coaxial cable transmits a signal that in many applications is a pulse code modulated (PCM) or phase modulated (PM) bit stream. Broadband coax, the technique employed in cable CATV systems, can carry baseband signals, but its more commonly used to deliver wideband RF signals divided into discrete channels and transmitted simultaneously. Optical fiber cables, however, continue to gain in popularity because of their unique advantages, such as very high bandwidth as well as immunity to and freedom from interference, crosstalk and ground loops. These advantages result in very low error rates and high reliability.

Depending on the kind of network control being considered, these local packet network alternatives are usually configured into one of four network topologies:

- *Point to Point*, which is simplest. It is also the costliest and least versatile architecture, and, surprisingly, most often used in telephone company based networks.
- *Star*, which is usually limited to central control nodes. This architecture lacks redundancy when a central node fails.
- *Ring*, which also lacks redundancy in its basic form. IBM's SDLC based loops embody a ring topology.
- *Bus*, which handles both direct computer-to-computer connections and cable used networks.

The mode of network control desired usually determines the choice of topology. A star architecture is employed when centralized control is being considered, whereas a bus architecture is the best choice for distributed control, where each node can gain network control from time to time. Ring architectures can use either central or distributed control.

Fiber optics, described by its adherents as the wave of the future, offers a variety of advantages. The high data rates possible on fiber optic cables can reach one or more gigabits. Unfortunately, this technology does not currently allow for inexpensive and commercially available multidrop operation. It is, however, valuable for long distance trunking, environments where isolation from electrical fields is important, transmission between computers at extremely high data rates, and in situations where security from interception is crucial.

Physically there is not much difference between baseband coaxial cable and broadband CATV cable. The first is a carrier wire surrounded by a woven mesh of copper, while the latter has a sleeve of extruded aluminum instead. The baseband is about half an inch in diameter and the broadband is only slightly wider. Both cost about the same per foot. But, in terms of capacity and capability, broadband is a significant improvement over baseband techniques.

For one thing, broadband networks such as Localnet use radio frequency (RF) transmission, which means that in comparison to baseband coaxial networks which have capacities varying from 1 to 10 Mbit/second, a single broadband cable can support a transmission rate of almost 200 Mb/s. Moreover, this increased capacity

—about 20 to 200 times that of baseband—can be wholly or partly dedicated to data communications and implemented at a cost comparable to, and often lower than, baseband networks.

Broadband cable has a capacity that is midrange between fiber optics and conventional media such as coax baseband. For each coaxial node, an ultimate of about 200 Mb/s of full duplex transmission line is available. All channel assignments using the broadband approach are usually done by frequency division multiplexing.

The efficiency of the broadband network lies in its ability to carry a multiplicity of signals with little or no loss or distortion. The RF nature of the signals offers very high signal to noise ratios, equivalent to bit error rates of 1 in 100 million to 1 in 100 trillion.

Broadband networks are very flexible and their structure—whether star, tree or a hybrid—is independent of the physical structure of the cable system. Growth of the network is simply a matter of adding new terminals to existing taps. A broadband network provides the capability for instantaneous reconfiguration of the interconnection by simply unplugging and re-plugging at a new location. With broadband technology, the user expands the network by securing a short piece of cable, adding the station to the network control database and installing the modems.

When a new building or floor of a building is added, a simple cable extension is all that is required. And when the traffic load approaches cable capacity, the network is reconfigured into a hierarchy, with subnetworks.

The one area where baseband has it over broadband is in installation cost. While the cost of broadband cabling is roughly the same as that of baseband—about \$.70 to \$3 per installed foot—the interface devices may cost anywhere from \$500 to \$2,000 per node.

For the foreseeable future, all three cable technologies coexist. Baseband, because of economics, will dominate for at least the next five years. During the latter part of the decade, broadband will take the lead. However, over the long run, according to a study by International Resource Development Inc., both coaxial approaches, as well as twisted wire, will be displaced by fiber optics, which offers even greater bandwidths at lower costs.

### Marketplace is expanding

In general, the total value of local network installations will exceed \$3.2 billion by 1990 and will consist of at least 3.5 nodes, according to the IRD study. With this kind of market at stake, a wide range of companies have entered the fray.

Typical of the baseband entries is Ethernet, developed by Xerox's Palo Alto, CA research center. It was developed initially as a broadcast packet switching medium in which each stations transceiver selects appropriate messages based on the packet's leading address. It was designed primarily to support Xerox's entry into the office automation market. Now the alliance involves Digital Equipment Corp. and Intel Corp. Zilog's Z-Net and Ungerman-Bass' Net/One. Typical capacity ranges from 200 to 300 nodes and overall distance is 1 to 2 miles.

Another major contender is Network Systems Corp., with its Hyperchannel and Hyperbus offerings. Similar to Ethernet in many ways, Hyperchannel can extend up



to one mile without repeaters. A maximum of 64 devices can be multidropped from Hyperchannel, which uses an eight bit address.

In the broadband arena, one of the first entries was Digital Communications Corp.'s Paklom system. A more recent, and dominant participant is Sytek Inc., with its manufacturing subsidiary, Network Resources Corp. Sytek offers two high performance network products, Localnet 20 and Localnet 40. It can support as many as 120 networks on a single cable. It can broadcast over 15 miles and a system can consist of up to several thousand LocalNet nodes without significant signal loss or increase in noise and error.

#### Various modems offered

In LocalNet, Sytek offers a variety of cable adapters called TBOX and TMUX units. The TBOX units are RF modems that also contain local packet switching intelligence at the station level. A TBOX contains a full duplex FM transceiver, which allows insertion of a 156 MHz spacing between the transmit and receive frequencies. The TMUX unit can be used to interface as many as eight devices with an RF transceiver. Other adapters are available to bridge channels on a cable using frequency agile modems integrated with a microprocessor. This device, a TBRIDGE, monitors four channels via software selection for packets requiring interchannel transfer.

To build an effective broadband local packet network that is reasonably low in cost, care has to be taken in the design of the modems used. There are basically only two choices. One is use the standard fixed frequency modem allocating one to each channel required. The other is build one modem that can address all the channels—a frequency agile modem. (Agility refers to a modem that is addressable and can be tuned or programmed to address any of a number of different channels.)

In the LocalNet, agility is achieved through the incorporation of intelligence in the form of an advanced microprocessor into various components. In system 20, each model 100 Tbox incorporates a Z80 microprocessor, allowing it to easily address any of 120 separate channels. It is also what executes the packet network protocols.

Several layers of communications protocol are necessary in the operation of a packet network, almost all of which is stored in firmware PROM, as instructions to be executed by the Z80. A few procedures are performed by the Z80 Synchronous I/O peripheral (SIO), which incorporates the HDLC protocol on-chip.

HDLC is the protocol that defines the packet's frame with beginning and ending flags, and also generates and verifies a check sum for each unit of data. It also addresses each channel.

The Z80 reads the character input from a terminal, formats this information into a packet, which consists of a header and a body of data. The header contains an address of the destination of the packet, the location of the specific model 100 Tbox. The packet gains access to the channel via a CSMA/CD mechanism, using the SIO chip to limit the beginning and ending of the frame and add the check sum information before transmission.

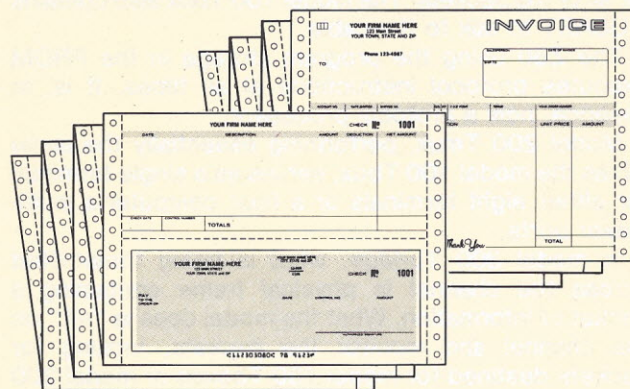
The packet is then transmitted as a sequence of bits across the channel. Then, either a model 300 Tbridge or another model 100 Tbox that has been designated as

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the destination picks up the packet, detects it, using the protocol chip. The processor will then read out each byte in the packet, check the address to determine whether or not the packet was for it, and check the CRC to make sure it was transmitted correctly. If not, it is rejected and the source model 100 Tbox will retransmit later. If transmitted correctly, the destination model 100 Tbox will transmit an acknowledgement packet back to the source. The processor then removes data bytes from the packet and feeds the information to the destination terminal.

In LocalNet, none of the terminals ever talk to the cable system directly. A block diagram of the model 100 Tbox would include a UART which talks to the terminal, a Z80 microprocessor which accepts the input data from the UART, a block of battery-backup CMOS RAM, about 2K bytes; also 2K bytes of ROM/PROM, both expandable up to 16K bytes. The PROM contains the protocol information. The CMOS RAM acts as the buffer storage for the blocks of data to be transmitted and translated for output through an RF modem to the destination terminal. There is also a parallel I/O port to control the modem agility and some of the front panel indicators. A timer chip does the retransmission timing for all of the packets. The model 100 Tbox also contains a USART to talk to the cable.

The Z80 using the program storage in the PROM executes protocol instructions at all times. It is, in essence, now a protocol processor.

Model 200 Tmux, performing essentially the same job as the model 100 Tbox, serves as a single terminus for either eight terminals or a host computer's multiplexer ports.

In model 300 Tbridge, what is being transmitted across the channel is physical frame containing a packet of information. What the model does is "sit" on the channel and monitor the packets, looking for packets destined for model 100 Tboxes or model 200 Tmuxes on other channels. If it sees one, it picks it up off the channel by copying it into its own buffer memory. It then retransmits it on another channel, the one closest to the destination. In a PROM, it maintains a value table that reflects the topology of the network and what model 100 Tboxes and Tmuxes are located on the channels to which it is connected. It is essentially of the same architecture as the model 100 Tbox, except that it contains more RAM, more ROM, and four USARTs, a faster Z80, and four modems.

### **Cable head is crucial**

Although it can be connected to any one of the cable taps, it is usually attached at the head end of the cable, with the rest of the centralized electronics. The cable head is where the analog transmission Tverter is also located, at the center of the cable system. This is a unique spot in the cable system, where all the trunks terminate.

The newer cable systems, are mostly bidirectional, in that they break the 400MHz spectrum into reverse and forward channels. In a CATV system, the low end, from 5 to 110 MHz, is the reverse and the 265 to 400 MHz is the forward portion. To prevent crosstalk, there is a guard band from 110 to about 265 MHz. For a complete bidirectional channel, it is necessary to up convert and down convert from one frequency range to the other. For most signals, this conversion takes place

in the head-end electronics where wideband analog devices take as much as 100 MHz of bandwidth and up converts it to the high end and back. To conform to this architecture, the LocalNet uses a Tverter, which converts up to 120 channels in a block back and forth between the high and low end of the spectrum.

The protocol techniques used throughout system 20 devices features a layered architecture that presents an X.28 line protocol to the user and an X.3 compatible packet assembly/disassembly (PAD) mechanism in a virtual circuit environment that incorporates both error control and flow control.

Similar to the ARPA net protocols, check sums are placed on each packet by the source model 100 Tbox, so that the destination model 100 Tbox can check for

## **The newer cable systems are mostly bidirectional**

errors, both single and double bit. If information is lost, the destination model 100 Tbox notifies the source model 100 Tbox and the packet is retransmitted. Essentially what we have done is compress the complex structure of an ARPA net into a single set of low cost boxes.

What the model 100 Tboxes also allow is matching of terminals with different data rates. In a situation where a 9600 baud terminal needs to communicate with a 300 baud terminal, the model 100 Tbox "throttles" the faster one, so that its net rate over a given period of time is only 300 baud. This is achieved through a series of communications between the two terminals. Each knows what its local baud rate must be. They exchange information about the baud rates of each and the status of their respective buffers and that of the Tbridge. Through a mutually agreed procedure, they arrange the various elements in the system to operate at a rate that is compatible to both. What it also means is that a host computer with a 1200 or 9600 baud rate can communicate quite easily with a network of low cost 200 to 300 baud rate terminals. It is no longer necessary to group host ports of various speeds with terminals of equivalent speed.

The system 20 modules have been designed so that secure channel capability can be added with the simple addition of the Data Encryption Standard algorithm. This DES algorithm is used for end-to-end encryption of user data. Each network node would contain its own master key. Encryption keys for data transport—session keys—are generated for each virtual circuit by a Key Distribution Center (KDC) and distributed to the participating nodes encrypted under the master keys. No node besides the KDC would need to store any other node's master key, thus enhancing total network security. Since a new session key is used for each virtual circuit, this approach assures that the keys used to transmit any sizable amounts of data are replaced after a relatively short life cycle. □



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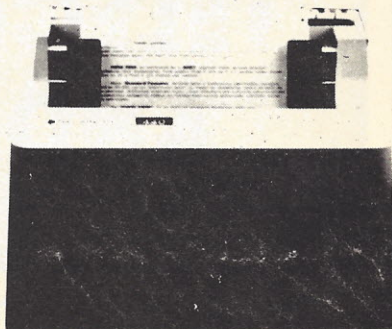


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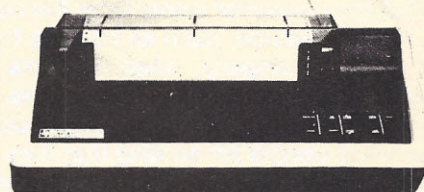
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# TELECOMMUNICATIONS AND THE CONSUMER

by Robert J. Hustwit

There is a new force loose in the land this decade, and very few high technology companies seem to know how to handle it. It's called consumerism. The American consumer is powerfully coming to the attention of the computer industry. That industry, long a bastion of unintelligible jargon and uncommunicative workers, is beginning to feel that, in order to succeed, they must sell themselves and their products as if they were cornflakes.

The consumer is not at all impressed with bits and bytes; as a matter of fact, he's turned off by them. What the consumer wants from the computing industry is reliable service, such as he gets from his telephone or electric company; when he picks up the phone, it works; when he flips the switch, the light goes on.

High technology manufacturers have been selling to technical people for so long that they are not prepared to cope with the mass marketing techniques necessary to capture the public's imagination. That's why the toy companies made the first significant computer inroads into American homes, while Tandy, Apple and Pet went after the "hobbyist" when they got started.

With the advent of The Source and Micronet two years ago, telecommunications came to the consumer...the information age had begun. While there has been no significant market penetration to date by either of these services, they have at least demonstrated the feasibility of such a concept.

Although there is no question that consumer telecommunications is the wave of the future, how this will hit has most big businesses puzzled. Major publishing houses, oil companies and high technology firms are all watching each development in the field, somewhat like a group of timid swimmers dipping one toe into a cold pool, knowing that they are going in, just not sure how.

The reason for this uncertainty is that nobody knows how the consumer will react to having massive amounts of current information available on an instantaneous basis in his home. Until there is more statistical data available, no one really wants to be next.

There are five major areas of service that a consumer information system must provide in order to be a serious contender in this new field.

First the system must offer current information to its subscribers. News, sports, weather, stock market information should be offered in data bases that are interactive and allow boolean logic searches through

the information. A corollary to this is that the system should be command-driven as opposed to menu-driven, as this gives the user much more flexibility and power. Some feel that the consumer won't want to cope with the complexities of the direct command mode, and will only use a menu-driven system, giving the user a limited number of choices. I don't agree. When information is offered to the consumer, he must have the ability to search through all available information, asking for and getting only what he wants.

Secondly, a system must allow access to other users. This is done through some type of electronic mail system. Such a system allows almost instantaneous delivery of messages from one user to another, with the system storing the message until the person for whom it is intended comes on-line. There should also be another way to communicate with system users, and that is direct, real-time, terminal-to-terminal communications. This feature should allow for private two-way conversations over the terminal, as well as private group conferencing.

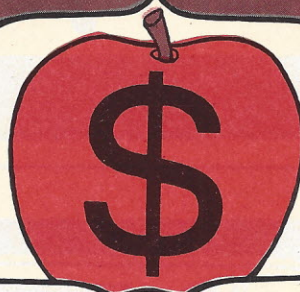
Thirdly, the system should provide both education and entertainment to subscribers. The line between good entertainment and good education is too fine to distinguish, so by putting the two together, I am assuming a high standard for both. Computer-type games, reading tutors, language instructions and three-player games (where you are one player, the computer is another and some other subscriber anywhere in the country is the third), are only a few items in this category.

Fourthly, the system should provide its subscribers some consumer services. These services could include tickets to major sporting events and shows, travel services, on-line buying services and bulletin-boards for subscribers. As the cost of getting around keeps going up, more and more services will be able to pay their way by entering the telecommunications field and allowing the consumer to shop or use their services at home.

Finally, a consumer-oriented service should offer some kind of time-sharing ability to its subscribers, giving them the opportunity to learn about and experiment with a large computer.

Offering service in these five areas is by no means all that is required of a consumer-oriented information service. Reliability is absolutely imperative, as well as the ability to handle at least 20% of its subscriber base on-line at any one time. Only then will an information service have the potential to be useful and ultimately necessary to the American consumer. □





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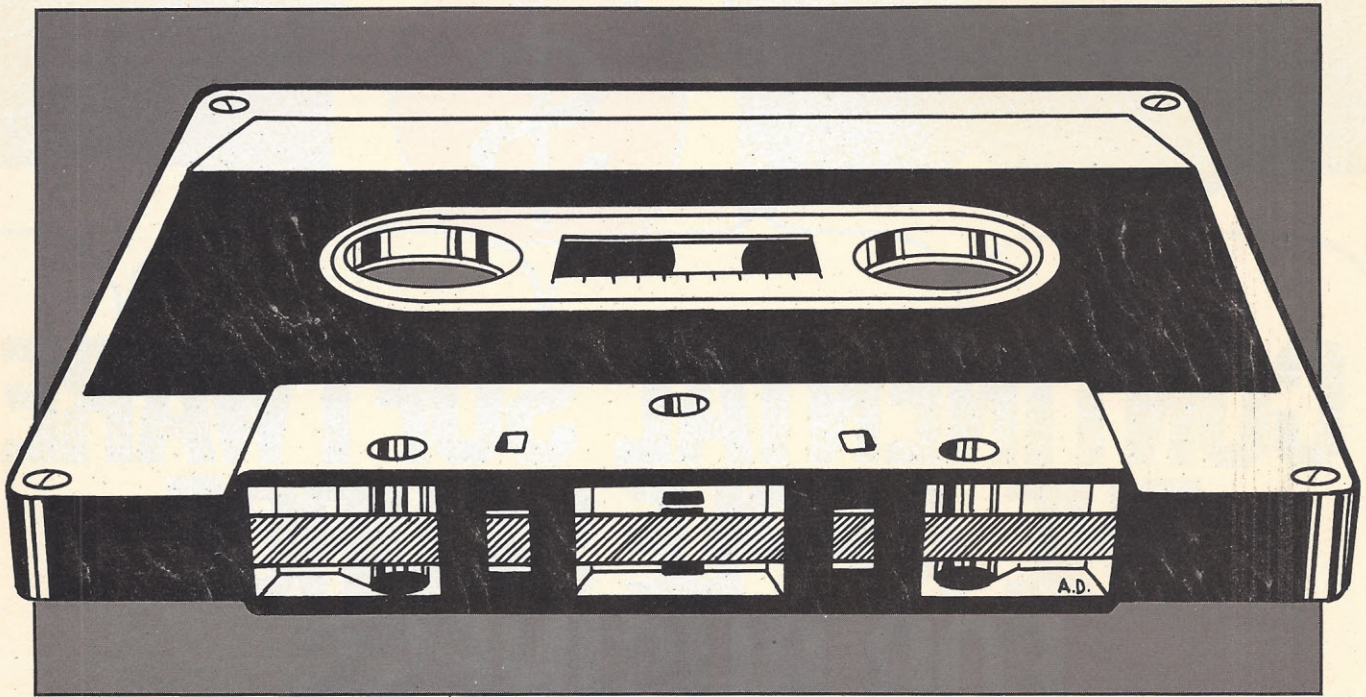
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# Maintain your Memory



## Caring for your Cassette Mass Storage System

—by T. J. Byers—

Aren't those inexpensive cassette recorder/players a wonderful substitute for that "beyond your budget" floppy disk memory? You bet. But, like all things, they are prone to occasional failure.

With prices soaring these days, a friendly visit to the local repair shop could set you back \$20 for a simple cleaning and adjustment; even more for serious maladies.

But you needn't rush it to an expensive qualified technician at the hint of trouble. Almost all problems are mechanically related, and can be avoided altogether. It doesn't take a lot of time or a crash course in audio servicing to keep your unit in top notch condition. Just follow a few simple steps and common sense. Don't wait for your machine to destroy a valuable cassette before implementing a regular maintenance program.

Dirt is by far the major factor in cassette failure, so let's take a look at removing it *before* it becomes a crisis. Data is transferred from the tape to the computer via the pick-up head in the deck. Now, the signal is generated by passing the magnetized tape across the head, inducing a voltage as the flux pattern changes. Since the tape must be in physical contact with the head to create the desired results, any foreign substance on the surface of the tape will be transferred to the head. This includes the ferric oxide that wears off the plastic backing through friction.

As the debris accumulates on the face of the head, it prevents intimate contact with the gap (in the head assembly), which senses the magnetic changes. This could ultimately result in loss of data or erroneous information.

The best and most economical removal method is to scrub it off with a solvent and a cotton swab—like a Q-Tip. Isopropyl alcohol (rubbing alcohol) is quite

effective. It dissolves the binder that holds the dirt to the head and evaporates quickly, leaving no residue.

Locate the tape head in your particular machine. It may be necessary to disconnect the power and engage the play function in order to advance the head to an accessible position. Moisten the swab with the alcohol and gently rub it across the front (tape) surface. You'll notice the swab now has a brown tinge to it. This is the oxide coating that has manifested itself to the surface.

Continue this procedure until the swab comes up clean—no coloring. If it is possible to visually examine the head—this sometimes means craning the neck—see that all the dirt is removed. In some cases, especially if this chore has been long neglected, the deposits are stubborn. Even though the cotton appears clean, there often is still junk on the face.

### Reluctant debris

In such a case, continue until it's all removed. *Never* try to scrape the material off with a screwdriver or any other instrument. It will only scratch the surface, quite possibly destroying the head. If the material is really reluctant, a commercial solvent sold through jobbers or record stores may have to be brought to bear on the problem.

A clean head should appear shiny and smooth. I recommend cleaning it before transferring data into the computer—every time. It takes but a minute and could really help you keep your cool in case the computer won't readily accept the input.

As the oxide builds up on the head, so it does on the pinch roller. The pinch roller is the wheel that transports the tape across the head by applying pressure to the



tape—squeezing tape between it and the capstan. Most pressure rollers are made of neoprene—not rubber. This increases the wear factor on the part, but it has a tendency to accumulate more dirt than rubber.

The debris collecting on the roller doesn't affect the quality of the signal at the head, but it is important to the proper control of the tape. As a matter of fact, this is the culprit that "eats" the tapes when it becomes too filthy.

The way to clean it is with the cotton swab and mineral alcohol...just as the head. Gain access to the roller. If it isn't easily accessible, it may be necessary to push the play button in order to move the mechanism forward (as you may have done to get at the head). With an up and down motion, run the gathered scrap from the rubber. Turn the wheel slightly as you proceed. This is a time-consuming job—don't rush it.

### Clean capstan

As the tip soaks up the dirt, renew it with fresh swabs. The cotton tip will never come completely clean like it does when swabbing a head, so visual inspection is a must. The progress will be apparent. It's also a good idea at this time to clean the capstan—removing any gummy substance that may be attached to it.

This needn't be done as often as cleaning the head. Just use good judgment as to when it's necessary. If you're using an inexpensive tape that flakes easily, it'll have to be done more frequently. Don't use a petroleum-based solvent—such as lighter fluid—to clean the pinch roller. When it evaporates, it leaves a tacky residue. The solvent could also do physical damage to the material.

It's a good idea to inspect the roller for cracks, chips, or indents. Never leave a tape in the machine with the roller engaged for long periods of time. It will definitely implant a dent into the wheel—and could quite possibly become stuck to it. You can visualize the results when power is once again applied.

Always keep an alert eye to any debris laying on the transport mechanism: dirt, dust, lint, etc. Remove it at the first signs.

There's more to a tape transport than meets the eye. You should plan an annual checkup.

All cassette decks use a belt drive system, and the belts are of the same rubberlike material used for the pinch roller. Since the belt(s) never come(s) in contact with the tape itself, there is little, if any, advantage to cleaning it or having concern of its well-being.

But neoprene has a nasty habit of rotting away. This condition is further aggravated by smog, ozone, humidity and all those other things floating in the air. It's just a matter of time before the entire thing crumbles to nothing.

Now, this could be as minor as not driving the capstan—hence, no tape movement—or a catastrophe when a tape is consumed if the take-up belt fails. To inspect the belt(s), it's necessary to remove the back from the unit.

Lay the deck face down on a table. You'll notice several holes in the case. Inside these wells rest the screws that attach the back. The screws are undoubtedly a Phillips head—but check to make sure. Remove the five or six screws. Always remove the batteries and inspect for screws in the battery case. They might not be readily visible on first inspection, but many manufac-

turers put them there. Keep track of which screw came from which hole. You'll probably have an assortment of machine and self-tapping screws of different lengths.

Gingerly lift the back. Don't force it; it should give easily. If not, seek out any overlooked fasteners. In some cases, there are wires attached to the back, so don't yank it free to gain a glimpse at the innards—but carefully maneuver the back to the side. It's not necessary to disconnect the wires, just treat them gently. Now before you are a circuit board, motor, capstan/flywheel and perhaps a few assorted sundries.

Locate the motor and you'll see the belt winding around the pulley. This is the main drive belt. It should be in good condition with no visible signs of wear.

I always like to replace it, seeing as I've gone this far already. They're inexpensive and readily available, either as an exact replacement from the manufacturer or as a general purpose replacement from several distributors. It's a good idea to keep a spare on hand for emergencies.

Chances are good the belt will be situated under a metal plate used to stabilize the capstan, which means you'll have to remove some screws. Normally there are three that are pretty tight, so avoid stripping the heads or you'll never get them out. Use the proper size tool and firm, even pressure.

Very, very carefully lift the plate while ascertaining if any springs, clips, wires or other devices are connected. There may also be a plate of some sort covering the pulley on the motor. If so, determine how to remove or circumvent it.

At this point, you probably have the back laying off to one side hugging the main body with two thin wires, several screws piled in two or three mounds, a precarious flywheel and a spring on the verge of snapping. Relax. Don't force anything. Remove the old belt and replace it with the new one.

Some decks contain more than one belt, usually a take-up reel drive of some sort. Inspect the take-up spindle for its drive. If it's belt-driven—replace it.

Occasionally, a deck will have a rewind and/or counter belt. These don't have to be replaced every time unless you're having a problem with that particular function or the belt appears damaged.

### Putting it together again

Now reverse the procedure, replacing the capstan plate first. There are probably some alignment holes it'll snap into, so pay attention. Don't try to fasten it down with the screws—everything should be in place before a screw is even inserted.

Replace all pieces you had to remove to gain access to the drive assembly. When everything is returned, nestle the back into position. Take note if a handle was removed prior to work. Such handles are usually attached through two slots at the top of the cases and is merely a convenience for transportation. If you wish, this little gem can be discarded.

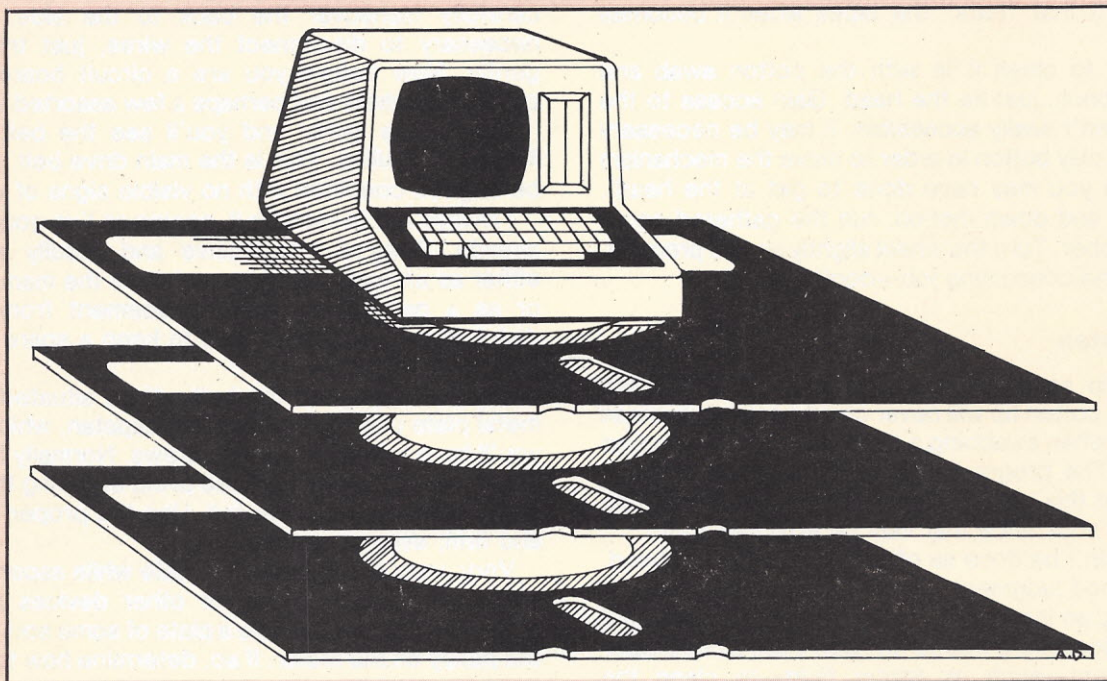
More than likely the monitor, remote and input jacks are mounted in a plastic strip that fell loose when the back was lifted. It slides into a slot cut into both halves of the case and is sandwiched into position when they are mated. Make sure it's in place and no wires are outside.

Replace the back screws, insert the batteries (if you use them) and you're in business. □



# PASCAL FOR CP/M

## MT MICROSYSTEMS' PASCAL/MT +



by Alan R. Miller

A major advantage of programming in a high-level language such as Pascal, Fortran, or Basic is portability. Programs developed on one type of computer can be expected to run on a very different computer with little or no change. Furthermore, these three languages are similar in many respects. Consequently, a program written in Fortran for an IBM/360 computer may be readily adapted to run in Pascal on a Z80 microcomputer.

There are several factors that might dictate the choice of a particular computer language for program development. A very important consideration is the clarity of the final source program. Computer programs need to be revised, often by someone other than the original programmer. Features that make a source program readily understandable are extremely important.

The Pascal language excels in this regard. Identifiers can be very long and may contain the underline character.

```
WEEKLY_PAYROLL and
MONTHLY_PAYROLL
```

Block structuring is based on the following blocks.

```
BEGIN
. . .
END
```

They can generally be used anywhere. Several loop constructions are available. These include the following.

```
WHILE . . . DO
REPEAT . . . UNTIL and
FOR . . . DO
```

A major disadvantage of Pascal, for microcomputer applications, is the relative size of the compiler. Fortran and Basic compilers typically require 25 to 30K bytes

of memory. Pascal compilers, on the other hand, are much larger, often requiring 50K bytes or more.

There are three different CP/M versions of Pascal that will run on an 8080 or Z80 microcomputer: Pascal/M, Pascal/MT +, and JRT Pascal. In addition, there is Pascal/Z, which requires a Z80 microcomputer, and UCSD Pascal, which does not run under CP/M. This month, we'll take a look at Pascal/MT + by MT Microsystems, Cardiff, CA.

Each of the 8080 versions has at least one unique feature that should be considered. Pascal/M (reviewed IA Sep 80) is very easy to use; new programs can be written and debugged with minimal effort. The compiler will usually flag the exact location of an error. It is easy to find and correct programming errors. The compiler, its associated programs, and the user's source program will all fit on one single-density, 8-in. disk or on one, double-density, 5-in. disk. The 32-bit floating-point operations use a 7-digit mantissa and have a dynamic range of  $10^{-38}$  to  $10^{+38}$ .

JRT Pascal (reviewed IA May 81) uses 64-bit BCD floating-point arithmetic. This arrangement provides 14 decimal digits of precision and a dynamic range of  $10^{-64}$  to  $10^{+64}$ . The compiler and its associated programs will fit onto a single disk.

Both the Pascal/M and the JRT Pascal compilers generate an intermediate code (called P-code) that must be interpreted by a runtime monitor. The Pascal/MT + compiler, by contrast, produces a relocatable module that is converted into binary 8080 machine code. The resulting COM file can be directly executed by typing its name at the command level. The result is greater execution speed; Pascal/MT + programs will run considerably faster than the others.

Another advantage of Pascal/MT + is the incorporation of two types of real numbers. Both BCD and binary



floating-point packages are provided. BCD arithmetic is generally more suitable for business application. It provides freedom from roundoff error, but at the expense of execution speed. Binary arithmetic, on the other hand, is more desirable for scientific applications. Pascal/MT+ is unique because both types are provided.

The BCD package utilizes 80-bit, fixed-point operations that give 18 decimal digits of precision. This is

```
x = .3333334E-04 x = .3333333E-05
x = .3333332E-06 x = .3333330E-07
x = .3333330E-08 x = .3333329E-09
x = .3333328E-10 x = .3333327E-11
x = .3333327E-12 x = .3333325E-13
x = .3333325E-14 x = .3333325E-15
x = .3333323E-16 x = .3333323E-17
x = .3333323E-18 x = .0000000E-18 !
x = .1229780E+19 x = .1134271E+18 !!
x = .1134271E+17 x = .1134271E+16 !!!
```

**Figure 1. Precision test of Pascal/MT+**

```
x = 3.33333E-5 x = 3.33333E-6
x = 3.33333E-7 x = 3.33333E-8
x = 3.33333E-9 x = 3.33333E-10
x = 3.33333E-11 x = 3.33333E-12
x = 3.33333E-13 x = 3.33333E-14
x = 3.33333E-15 x = 3.33333E-16
x = 3.33333E-17 x = 3.33333E-18
x = 3.33333E-19 x = 3.33333E-20
x = 3.33333E-21 x = 3.33333E-22
x = 3.33333E-23 x = 3.33333E-24
x = 3.33333E-25 x = 3.33333E-26
x = 3.33333E-27 x = 3.33334E-28
x = 3.33334E-29 x = 3.33334E-30
x = 3.33334E-31 x = 3.33334E-32
x = 3.33334E-33 x = 3.33334E-34
x = 3.33334E-35 x = 3.33334E-36
x = 3.33334E-37 x = 3.33334E-38
x =
Floating point error
(error message from compiler)
```

**Figure 2. Precision test of Pascal/M**

```
x = +0.333333333333333E-04 x = +0.333333333333333E-05
x = +0.333333333333333E-06 x = +0.333333333333333E-07
x = +0.333333333333333E-08 x = +0.333333333333333E-09
x = +0.333333333333333E-10 x = +0.333333333333333E-11
x = +0.333333333333333E-12 x = +0.333333333333333E-13
x = +0.333333333333333E-14 x = +0.333333333333333E-15
x = +0.333333333333333E-16 x = +0.333333333333333E-17
x = +0.333333333333333E-18 x = +0.333333333333333E-19
x = +0.333333333333333E-20 x = +0.333333333333333E-21
x = +0.333333333333333E-22 x = +0.333333333333333E-23
x = +0.333333333333333E-24 x = +0.333333333333333E-25
x = +0.333333333333333E-26 x = +0.333333333333333E-27
x = +0.333333333333333E-28 x = +0.333333333333333E-29
x = +0.333333333333333E-30 x = +0.333333333333333E-31
x = +0.333333333333333E-32 x = +0.333333333333333E-33
x = +0.333333333333333E-34 x = +0.333333333333333E-35
x = +0.333333333333333E-36 x = +0.333333333333333E-37
x = +0.333333333333333E-38 x = +0.333333333333333E-39
x = +0.333333333333333E-40 x = +0.333333333333333E-41
x = +0.333333333333333E-42 x = +0.333333333333333E-43
x = +0.333333333333333E-44 x = +0.333333333333333E-45
x = +0.333333333333333E-46 x = +0.333333333333333E-47
x = +0.333333333333333E-48 x = +0.333333333333333E-49
x = +0.333333333333333E-50 x = +0.333333333333333E-51
x = +0.333333333333333E-52 x = +0.333333333333333E-53
x = +0.333333333333333E-54 x = +0.333333333333333E-55
x = +0.333333333333333E-56 x = +0.333333333333333E-57
x = +0.333333333333333E-58 x = +0.333333333333333E-59
x = +0.333333333333333E-60 x = +0.333333333333333E-61
x = +0.333333333333333E-62 x = +0.333333333333333E-63
x = +0.333333333333333E+00 x = -0.333333333333333E+63 !
x = -0.333333333333333E+62 x = -0.333333333333333E+61 !!
```

**Figure 3. Precision test of JRT Pascal**

basically an integer representation that maintains four digits past the decimal point. The floating-point package uses 32 bits and is compatible with the AMD9511 hardware processor. Unfortunately, both the precision (5 decimal digits) and the dynamic range (10-17 to 10+17) are less accurate than the other Pascal packages. MT Microsystems expressed a desire to improve this, however.

A floating-point arithmetic package can be readily tested with the Pascal program shown in the listing. This short program generates a repeating decimal that cannot be precisely represented by a computer. Then, the result is repeatedly multiplied by the value of 0.1 and the result is displayed on the console. Eventually, a floating-point underflow will occur. At this point, the program should set the result to 0 or should terminate the execution. This program was run with Pascal/MT+, Pascal/M and JRT Pascal. The corresponding results are shown in figures 1, 2, and 3.

With Pascal/MT+, roundoff error begins to appear in the fifth decimal place. Furthermore, floating point underflow occurs at 10-19. Unfortunately, this does not abort the program, so meaningless results are returned. Thus, multiplying 0.33E-18 by 0.1 produces a result of 0E-18. But, multiplying this value by 0.1 gives an incorrect answer of 0.12E+19.

The Pascal/MT+ package is very large, requiring six single-density 5-in. diskettes for all routines. However,

```
PROGRAM test(output);
(* test range of floating point numbers *)
(* Copyright, Sybex, 1981 *)

VAR
  i : integer;
  x : real;

BEGIN
  writeln;
  x := 1.0E-4 / 3.0;
  FOR i := 1 TO 40 DO
    BEGIN
      write(' x = ', x);
      x := 0.1 * x;
      writeln(' x = ', x);
      x := 0.1 * x
    END
  END.
```

**Figure 4. A test of the floating point operations**

not all of the programs are needed at any one time. Some programs are used during the compiling step, while others are needed during the linking step. In addition, there is a disassembler and a debugger that may not be needed at all.

The compiler and linker can be placed on one diskette. The overlay routines just fit a second, 5-in. double-density diskette. The user's source program and the resulting REL file and executable binary file can then reside on a third diskette. Only two disks are needed with 8-in. drives.

An extensive list of compiler errors in the user's manual are identified by number. Both Pascal/M and Pascal/MT+ utilize these numbers for most of the compiler error messages. For example, an undeclared variable is indicated by error number 104. This greatly simplifies the identification of errors that might occur during the compiling step.

The 3-character extension name that is a part of all CP/M filenames is usually chosen to reflect the nature of the contents of each file. Thus, BAS is used for Basic files, FOR for Fortran files, and ASM for assembler files. The extension of PAS is typically chosen for Pascal source files. Unfortunately, the Pascal/MT+ compiler first looks for a file extension of SRC (for source). If that can't be found, it then looks



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for an extension of PAS. There is a potential conflict if you sometimes use Pascal/Z, since this compiler generates files with the extension of SRC.

One nice feature of Pascal/MT+ is modular compilation. Very large programs can be separated into smaller portions and separately compiled. They are then combined with a small linking loader into an executable binary file.

It allows assembly-language statements to be placed directly inline, between regular Pascal source statements. This feature can be used to generate permanent, local variables in procedures and functions. Since local variables are cleared at the conclusion of a procedure or function, they cannot be used to store a seed for a random number generator. In this case, the old seed can be retrieved from a memory location by using an 8080 LHLD instruction. Then the new seed can be stored back into the memory location with an 8080 SHLD instruction.

Standard Pascal includes the predefined data types of real, integer, boolean and character. Pascal/MT+ additionally includes the types of string, byte, and word.

With standard Pascal, a sting variable is defined as an array of characters.

VAR

STRING1 : ARRAY[1..5] OF CHAR;

STRING1 := 'ABCDE';

But the length is then fixed to its declared value of 5 in this case. The variable cannot be shorter or longer. By contrast, the dynamic string type is implemented in Pascal/MT+ (and Pascal/M). In this case, strings can be variable in length just as they are in Basic.

VAR

STRING1 : STRING

STRING1 := 'ABC';

Pascal/MT+ also has a set of built-in routines for manipulating string variables. The LENGTH function can be used to determine the actual length of a string, the CONCAT function is used to concatenate strings, and the POS function finds substrings of characters.

Additional built-in routines can be used to manipulate bytes and bits or to shift blocks of data. The EXIT routine addresses one of the deficiencies of Pascal. When an error condition is discovered in a procedure, it should be possible to set an error flag and then return directly to the calling program. But there is no easy way to do this in standard Pascal. The Pascal/MT+ EXIT routine can be used for this purpose. Pascal/M has a similar feature but the format is different.

Pascal/MT+ makes several passes through the source code during the compiling step. Because of this arrangement, procedures may be nearly any length. By contrast, a single-pass compiler such as Pascal/M requires each procedure to be less than 128 bytes in length.

Earlier versions of Pascal/MT were very incomplete. If you tried one and were disappointed, consider the latest version. It contains almost all of the standard features, as well as some additional items. Your CP/M system should be at least 52K bytes, though. Pascal/MT+ seems to be a very desirable package. □

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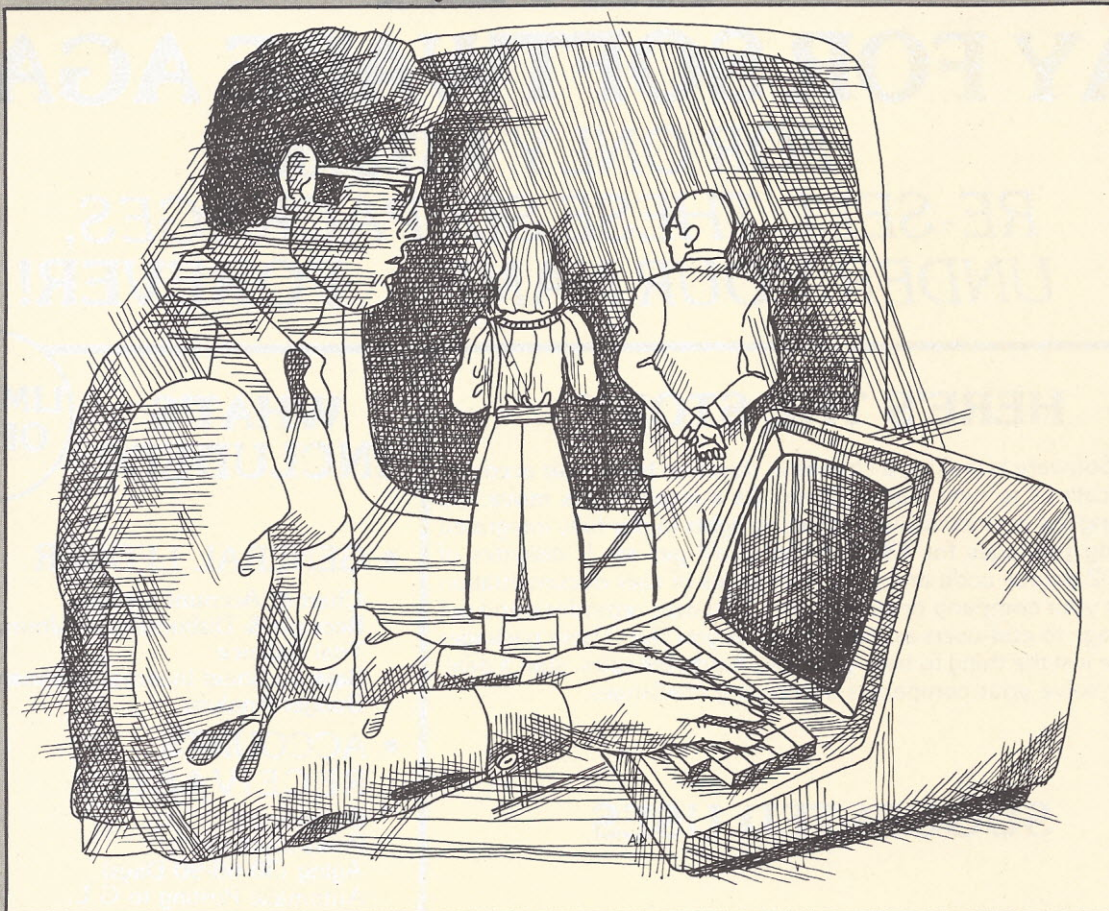
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# Bulletin Board

by David D. Busch



Those who communicate with other computer owners through The Source, Micronet, or various group systems find that the community bulletin board feature is one of the most interesting and useful aspects of such a system. Messages can be posted for later pick-up by a specified recipient—or more general “to whom it may concern” broadsides offer the opportunity to make public announcements.

The same concept can also be applied on a smaller scale. If your computer spends a great deal of time just sitting there waiting for the next programming session, you can put it to work as a single-system bulletin board. Members of your household/office/organization can glance at the CRT screen throughout the day, post messages for others, and retrieve their own through the accompanying program.

A modicum of security is built into the program. Messages are filed either for retrieval by “anyone”, or in the name of a specified authorized recipient, who has previously entered a password of his or her own choice. If the personalized mode is selected, only those who can supply their personal password can retrieve a message intended for their eyes. In the general mode, a bulletin can be posted for retrieval by anyone interested in reading it. Each message automatically includes the time of day in which it was filed.

The program was written for a disk-based TRS-80 model I. It will run under TRSDOS, NEWDOS 2.1, or NEWDOS 80, although TRSDOS users will have to turn on their machine's real time clock before loading the program. Security of the messages is provided

by disabling the BREAK key once the program is run. This prevents the casual outsider from intercepting the items posted.

When the program is first run, the real-time clock is turned on through a CMD “Clock” (NEWDOS only—TRSDOS users perform this step manually, and delete line 70). Then, the user is asked to supply the current hour (HR) and minutes (MN). These are POKED into the appropriate memory locations by the time-setting routine (lines 70-170).

Next, the BREAK key is disabled. TRSDOS, NEWDOS 2.1, and NEWDOS 80 users should select the appropriate line from 190-210, and delete the other two, or by-pass them with REMs.

The start-up menu is displayed. An existing message file may be loaded from disk (line 240). Use of this disk storage file allows shutting off the computer, or applying it to other tasks without losing the messages entered so far. Alternatively, the bulletin board may be started with a “clean” slate. Next a choice is offered between turning the bulletin board on, and adding new authorized users to the current file. Regardless of which option is selected, the program first loads the existing user and password files, which are stored in a sequential disk file called USERS. The number of users currently in the file (US) is first input from the disk (line 370), and then a FOR-NEXT loop of one to US loads the users' names and passwords into a pair of string arrays, USER\$(n) and PW\$(n).

If additional authorized users are to be input (lines 450-510), US is incremented by one, and a name and



password can be entered. Then, the new file is saved to disk in a routine at lines 530-600.

The bulletin board is activated at line 620. If no messages have been entered, this information is flashed on the CRT screen. Otherwise (MFLAG>0), the names of those for whom notes have been filed are displayed, along with the total number of messages that are waiting in the file. An INKEY\$ strobing loop looks at the keyboard for input while the bulletin board is in its "wait" mode, and drops down to a retrieval/file message menu (lines 760-860) when any key is pressed.

An error trap returns the program to its wait state if an attempt is made to retrieve messages when none are filed, or if someone enters an incorrect password.

When a new note is to be entered into the file, NM, the number of messages in the file, is first incremented by one (line 1140), so that the next item entered will be placed in the next position in the array MS\$(n), which stores the messages at MS\$(NM).

### Access for one or all

First, a list of current users plus the wild-card "Anyone" are printed to the screen. The recipient of the note is indicated by entering the number opposite that person's name. The message, which may include commas and other string delimiters, is LINEINPUT. Each note can total 255 characters—approximately 246 for the message itself, and eight for the time at which the message was filed. These eight characters, e.g. 12:40:15, are appended onto the end of each message automatically (lines 1330-1340). The message string, name of recipient, and that recipient's password are loaded into MS\$(NM), NM\$(NM) and RT\$(NM) respectively. The only exception is when bulletins are designated for availability to "Anyone". In this case, a null password is assigned (line 1350). The person filing a message never sees the recipient's password, and so is unable to retrieve his own bulletin once it has been filed.

When a user has elected to retrieve messages, control branches to line 880, where a FOR-NEXT loop lists the intended recipients for all the messages in the file. Every 10 messages, the computer pauses (see line 910), before clearing the screen and presenting the next series of up to 10 message-recipients.

To access (or attempt to access) a bulletin, the retriever enters the number of the message. The program then asks for the password, if one is required (line 1040), and lists the note to the screen if a proper

match is achieved. Otherwise, the bulletin board waiting mode is resumed.

Like most security systems for personal computers, the one built into this program will stymie only the unsophisticated or casual user. First, although BREAK is disabled, the computer can be re-booted normally through use of the reset key. This step assumes that copies of a DOS disk are nearby, or can be provided by the eavesdropper. One simple method of preventing regaining control of the computer through a reset is simply to lock up the diskettes, or remove and hide the disk drive connecting cords.

But, assuming that the computer can be reset and re-booted, a nefarious security-cracker, using Basic, can get the program back and examine the listing without executing a RUN (which would re-initialize variables, and erase the messages currently in memory—and, of course, re-disable the BREAK key). From the listing it would then be a simple step to find the significant variables, and enter PRINT MS\$(1), MS\$(2), etc. in command mode to read each message. Alternatively, the security-breaker could use appropriate GOTOs to read in the disk file containing the passwords, and learn all the passwords for the authorized users. Then, messages could be retrieved at leisure on each future visit to the machine.

I point up the ways around the protection measures only to head off any false feelings of security. In the typical microcomputer environment, absolute integrity of such messages is not a high-priority item. The password feature merely makes the program more interesting to use.

The program probably functions best in a household or small office where there are only a few authorized users, or where most messages will be of the "to whom it may concern" variety. The TRS-80's screen can display only a dozen or so users as this program is written, without some minor re-writing of a few lines. The simplest way to print more names to the screen at once is to add a STEP 2 to the display loops, such as the one in lines 1150-1170, and then have both USER\$(N3) as well as USER\$(N3+1) printed to the screen on the same line. Use TABS to separate the two. STEP 3, and USER\$(N3+2) can be added to print three columns of names.

Another useful enhancement would be to add a means of deleting a message once it has been retrieved—but don't allow broadside notes intended for "anyone" to be killed. □

**Program on page 152**

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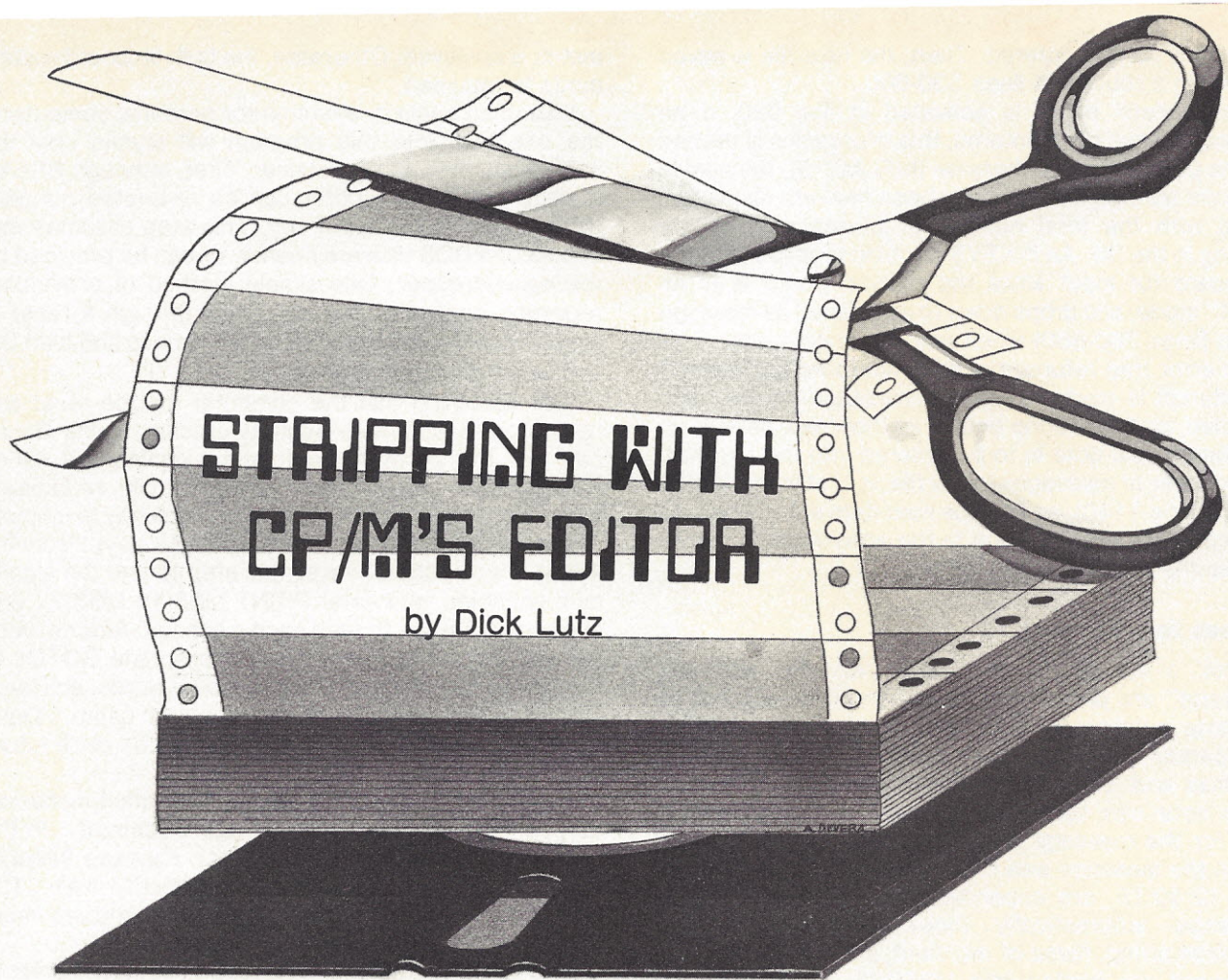
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If you've ever had the experience of discovering a problem in one of your programs that you thought was bug-free, you know the value of including extensive commenting in Basic programs—either because the REMarks helped you out of trouble, or because, without them, it took twice the time.

Trouble is, REMarks take memory space when a program is running, but contribute absolutely nothing to your computer's understanding of what to do. As a general rule, we like to leave as much RAM as possible free to hold text, variables, arrays and so on. Fortunately computerists can have their remarks—and the RAM space they require.

CP/M's ED provides a quick and easy way to "strip" a program of its REMarks in just a few minutes. And while other text-editing programs may be preferable for most uses because of their visual feedback, ED does provide some powerful commands that, once understood, can do the stripping job in minutes.

The accompanying listings provide the detail, but, in a nutshell here's the sequence:

- 1) The program to be edited must be saved in ASCII mode. In Microsoft Disk Basic:  
SAVE "PROGNAME",A
- 2) In CP/M, start the process by commanding:  
ED PROGNAME.BAS
- 3) When ED prompts \*:  
#AB<carriage return>  
(see listing for explanation and example.)
- 4) B<cr>
- 5) #S'^^Z'^^Z<cr>  
(or a variation of this; see listing 2.)

- 6) B<cr>
- 7) #MJ'^Z'^L'^Z<cr>  
(Listing 3)
- 8) B<cr>
- 9) #MF '^L'^Z - 1L1K<cr>  
(Listing 4)
- 10) B<cr>
- 11) #S'^Z'^Z<cr>  
(Listing 5)
- 12) B<cr>
- 13) #S'^^Z'^Z<cr>  
(Listing 6)
- 14) E<cr>

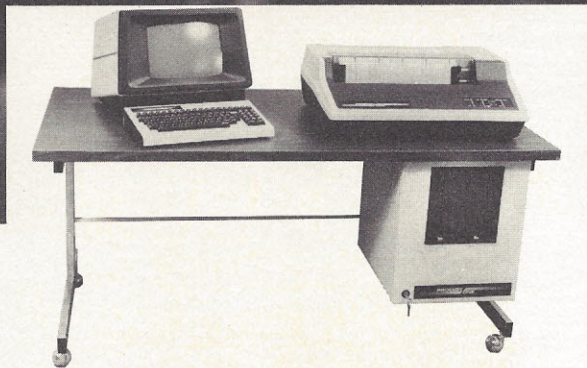
Presuming that everything is working properly, this sequence will leave you with pre-protected jump-target REM lines intact, but all other comments stripped from the program. On the disk, you'll have PROGNAME.BAS as the stripped program, and PROGNAME.BAK as the unstripped program.

You may still worry that your machine doesn't have enough memory to hold a really large program *and* its comments, but you can solve this by writing in structured program form, debugging as you go, and saving block sections of your programs with REMarks intact, never assembling a fully commented version until you've finished. Then, regardless of the size of available memory, you can use CP/M PIP to concatenate (link) the pieces, with and without comments. □

**Program on page 156**



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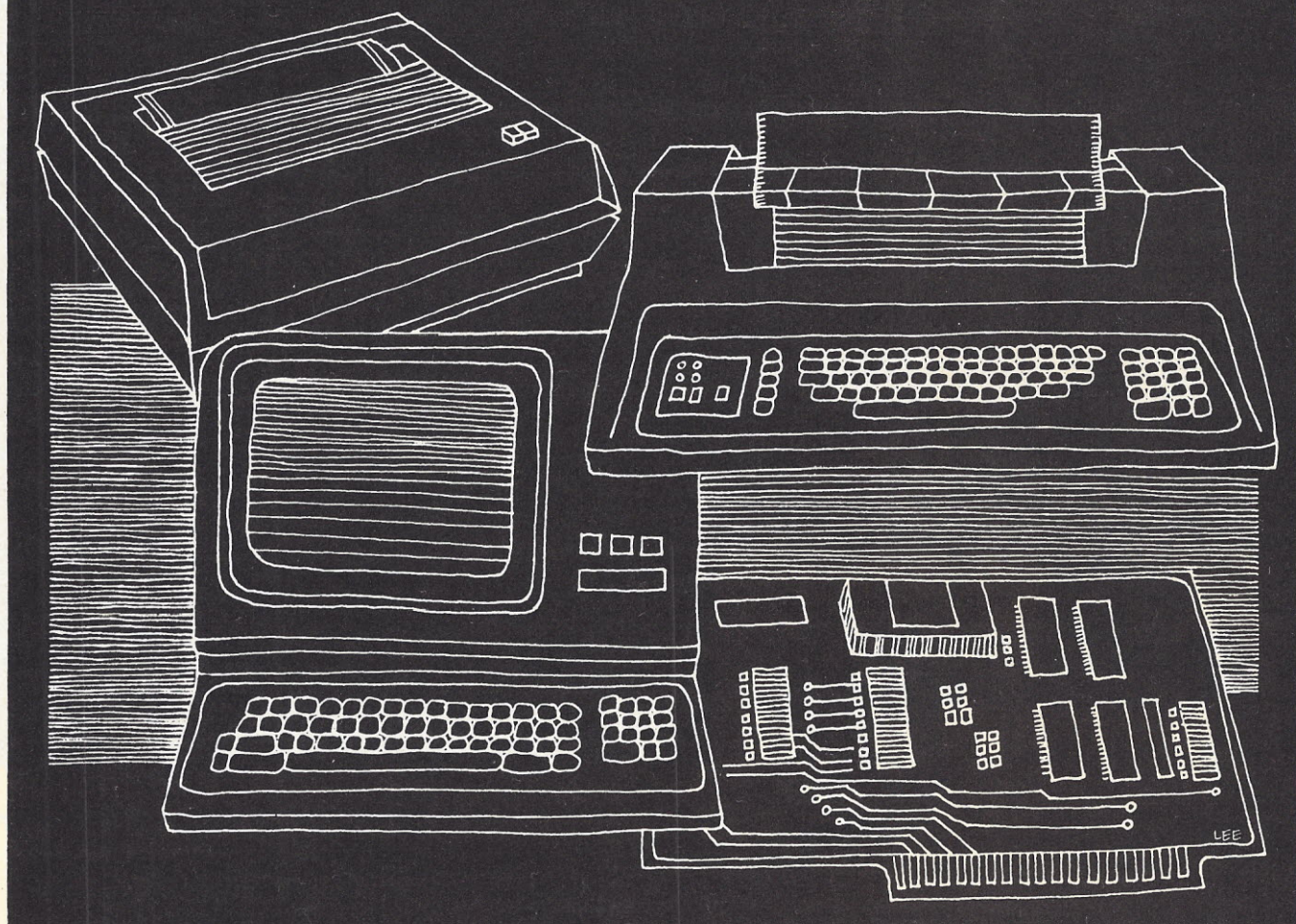
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CIRCLE INQUIRY NO. 69

\*Prodigy's easy to use compiler-based small business applications development language. Prodigy also supports other popular languages such as FORTRAN, COBOL, BASIC, and PASCAL.



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COMPONENTS .....	103
CPU/MEMORY .....	104
DATA COMMUNICATIONS .....	108
I/O .....	112
MISCELLANEOUS .....	116
PERIPHERALS .....	118
SYSTEMS .....	120
TOOLS & TEST .....	126

## SOFTWARE

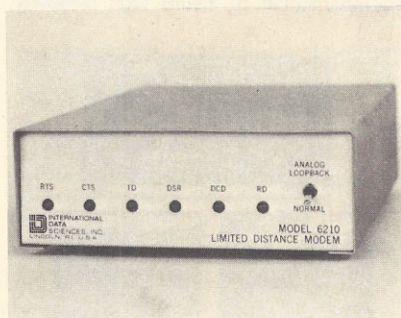
BUSINESS .....	128
EDUCATIONAL .....	132
GAMES .....	134
SYSTEMS .....	135
UTILITY .....	136



# HARDWARE

## COMPONENTS

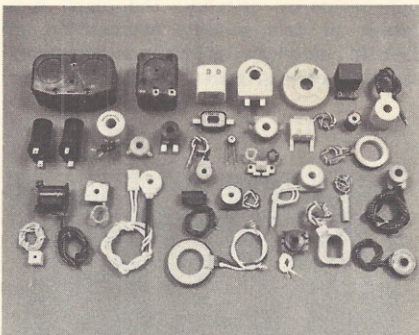
**Limited distance modem** is designed for asynchronous operation over TELCO or private 2- and 4-wire non-loaded metallic (twisted-pair) conductors at speeds up to 9600 bps. It can be used in both point-to-point and multidrop network configurations and is ideally suited for local data distribution up to 7 miles using conventional 26-gauge wire. Features of the model 6210 provide internal strap selections for constant or controlled RTS, high or low transmit level, 2-or 4-wire operation, and normal or high receiver impedance. The modem employs a pulse modulation scheme that varies the



transmit signal polarity on a balanced line. Transmit and receive lines are transformer coupled; therefore, no DC continuity is required. Its data terminal equipment interface meets EIA RS-232 and CCITT V.24 specifications and the transmitted signal level conforms to Bell Canada "Requirement for Connection of Equipment to Private Metallic Circuits" and A.T.&T. Pub. 43401. A 20 mA TTY current loop interface is also available. Price: \$300. International Data Sciences, Inc., 7 Wellington Rd., Lincoln, RI 02865, (401) 333-6200.

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**Coils** use a patented process that results in absolutely uniform and hermetically sealed encapsulated coils with a lead pull strength equal to the tensile strength of the lead wire



itself. In many cases the coil design can incorporate design features for mounting. B.W. Darrah, Inc., 538 Randy Rd., Carol Stream, IL 60187, (312) 690-8810.

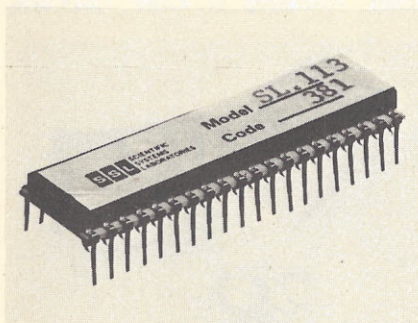
**CIRCLE INQUIRY NO. 226**

**Miniaturized switch**, measuring .700 by .700 by .472 inches, offers a choice of basic switch model assembly including either inline, L formation, modules fixed or sliding on the shaft, modules spaced and linked by the control shaft, or with modules separately

controlled by concentric shafts. It matches the available space on a printed circuit board independent of the control knob. The MIL series offers a shorting-non shorting contact and has nominal voltage of 50 V RMS. The mechanical life expectancy of the switch is 50,000 operations in 1 circuit and 12 positions. It can withstand temperatures from -40°F to +185°F (-40°C to +85°C). Price: \$6.20 per section (1,000 piece lots). ITT Schadow, Inc., 8081 Wallace Rd., Eden Prairie, MN 55344, (612) 934-4400.

**CIRCLE INQUIRY NO. 227**

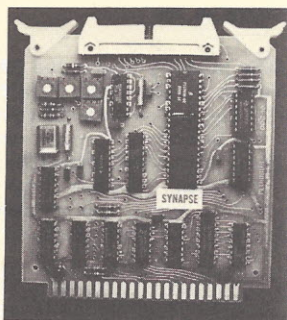
**Modem ICs**, the SL113A and SL113B, are originate and answer modem ICs capable of operating at up to 300 baud from 5 VDC supplies. Designed to interface between the UART and line coupler, these ICs will simplify



design of Bell-compatible communications systems. Price: \$95. Scientific Systems Laboratories, 2031 E. Cerritos, Ste. 7J, Anaheim, CA 92806, (714) 776-5003.

**CIRCLE INQUIRY NO. 228**

**Disk controller card**, compatible with a multiplexed bus to permit high chip densities, features a type 1793 disk controller chip capable of controlling up to four 5¼-in. or 8-in. soft sectored drives, either single, double (5¼-in. only) or a mix of both densities. The compact 4½-in. sq. card is

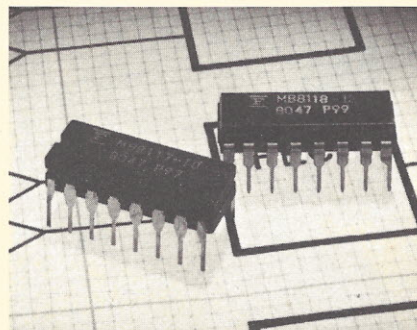


compatible with the multiplexed N-44 bus for optimum chip density. To minimize error rates, the Synapse DDC-10 disk controller incorporates a high reliability, phase lock loop data recovery circuit. It is compatible to the N-44 bus which uses a 44-pin edge connector with 0.156-in. spacing pins and an 8-bit databus multiplexed with the lower 8 bits of the address. Price: \$395. Synapse Corp., 199 Main St., N. Falmouth, MA 02556, (617) 563-2267.

**CIRCLE INQUIRY NO. 229**

**16K dynamic RAMs** with single 5 volt power supply requirements and access times as fast as 100 nS consists of two parts—the MB8117 and MB8118. Both are available with either a 100-nS access time and a 235-nS cycle time, or with a 120-nS

access time and a 270-nS cycle time. Features of the new MB8117/MB8118 family include: maximum power dissipation of 182 milliwatts (active) and 19.5 milliwatts (standby); voltage tolerance of  $\pm 10\%$  on 5 volt supply; on-chip bias generator; standard 16-pin DIP housing; Read-Modify-Write, RAS-only refresh, hidden refresh and Page-Mode capability; TTL-compatible inputs, and JEDEC-approved pin-out. The RAMs are ideal



for high-speed, high-performance applications such as mainframe memory, buffer memory, peripheral storage and environments where low power application and compact layout are required. In addition, their pin-out design makes it possible to upgrade to 64K RAM with only minor modifications. Fujitsu Microelectronics, 2945 Oakmead Village Court, Santa Clara, CA 95051, (408) 727-1700.

**CIRCLE INQUIRY NO. 230**

**Speech synthesizer chip** that combines electronic generated phonemes to produce unlimited vocabulary, the SC-01, is now available in low-volume quantities. A phonetic speech synthesizer has flexible vocabulary: i.e. words and phrases are not limited to a pre-defined amount or format as they are with synthesizers that reconfigure words and phrases from pre-recorded human voice tracts. Customers for the SC-01 chip can



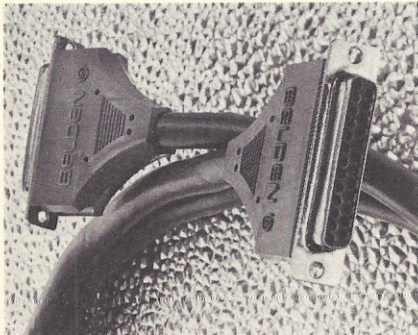
custom design their own vocabulary via a unique vocabulary development system that contains an algorithm which automatically translates English text into phonemes. The SC-01 chip requires fewer bits, or digital codes, to produce intelligible speech. One second of speaking time requires only 70-100 bits of memory with the chip. Price: under \$37.50 per unit. Votrax Inc., 500 Stephenson Hwy., Troy, MI 48084, (800) 521-1350.

**CIRCLE INQUIRY NO. 231**

**Interface cable assemblies** for interconnecting data terminal equipment and data communications equipment, feature a Belden 25-conductor shielded cable in lengths from 5 to 70 ft., and shielded male or female subminiature D connectors at each end mounted within a special molded handle. The completely shielded design protects signals



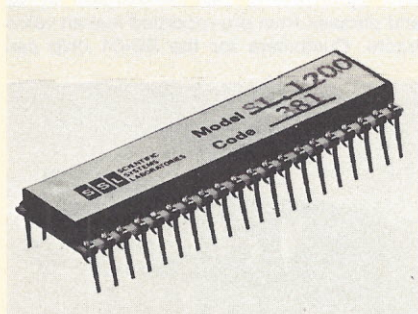
from external EMI/RFI, reducing bit error rate and maximizing system performance. Shielding also minimizes signal radiation from the cable assembly, and potential interference with nearby electronic devices. Cable specifications for Type 33 general-purpose shielded RS-232C assemblies: 22-ga. stranded tinned copper conductors; overall Duofoil foil-film-foil shield with drain wire; color-coded PVC insulation; chrome



PVC jacket, 0.395 in. OD; nominal capacitance, 35 pF/ft.; nominal impedance, 50 ohms; working voltage, 150 vdc; and UL style 2576. Type 33 general purpose RS-232C cable assemblies are offered in ten standard constructions in lengths of 5, 10, 25, 50, and 70 ft. with male/male and male/female terminations. Price: from \$21.06 (5 ft.). Belden Corp., Interconnect Systems Operation, 105 Wolfpack Rd., Gastonia, NC 28052

**CIRCLE INQUIRY NO. 232**

**Modem IC**, the SL1200, an advanced IC, operates as an FSK modem for data rates to 1200 baud. Containing a continuous phase, sinusoidal FSK modulator and a balanced demodulator, the element performs binary



conversion to telephone carrier signal and reconversion into binary form. The unit operates at 5.0 VDC. Price: \$95. Scientific Systems Laboratories, 2031 E. Cerritos, Ste. 7J, Anaheim, CA 92806, (714) 776-5003.

**CIRCLE INQUIRY NO. 233**

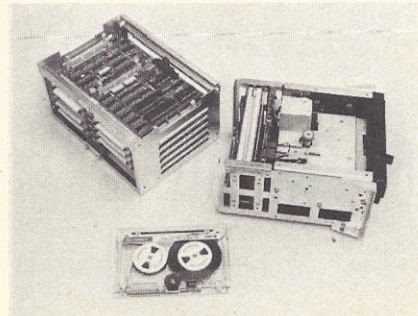
## CPU/MEMORY

**Memory expansion system**, Axlon 256, increases storage capacity of the Atari 800 computer from 48K of RAM up to 256K, providing a 500% expansion of the RAM currently available in the Atari system. The system is plug-in compatible with the Atari 800. Installation is accomplished by inserting the system interface card into the second RAM slot in the 800 and the PIA control cable into the Atari control jack. All interface hardware is included with the system and no modifications are required. The system comes with two 32K RAMCRAM modules

and additional modules can be added until the full 256K capacity is achieved. Atari RAM modules can also be used in the system. Price: \$895. Axlon Inc., 170 N. Wolfe Rd., Sunnyvale, CA 94086, (408) 730-0216.

**CIRCLE INQUIRY NO. 234**

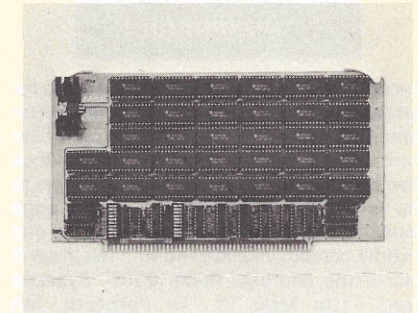
**Data cartridge system**, HCD-75, gives a 4 by 6-in. data cartridge more than twice the capacity of a 2,400-ft. reel of 1/2-in., 1,600-bpi computer tape or dozens of floppy disks. The drive system and its cartridge provide 67M bytes of user data storage capacity (total unformatted tape capacity of 144M bytes). This capacity, coupled with a continuous information transfer rate of 17.5K bytes per second, makes the system the ideal backup for fixed disk drives, such as the 1/4-in. and 14-in. Winchester type disk drives. Formatting at 4,096 1,024-byte



blocks per track (16 tracks 65,536 blocks total) allows any block position on the tape to be addressed from a single 16-bit word. Length of spacing between keys gives added protection when overwriting and also increases the margin for interchange between machines in cases where one machine is on the low side of specs and the second machine is on the high side of specs. This change is designed to accommodate worse case conditions. Price: \$2,800. 3M Data Products, Dept. MN81-18, 223-5E, 3M Center, St. Paul, MN 55101.

**CIRCLE INQUIRY NO. 235**

**Fully static memory board**, the RAM 17, is the highest density static RAM for the S-100/IEEE 696 bus on a standard 5-in. high board. It has 64K of memory and runs with 6 MHz Z80s and 10 MHz 8086/88s, lower power dissipation, freedom from alpha particle soft-bit errors, and problem free DMA operation. The RAM 17 meets all the

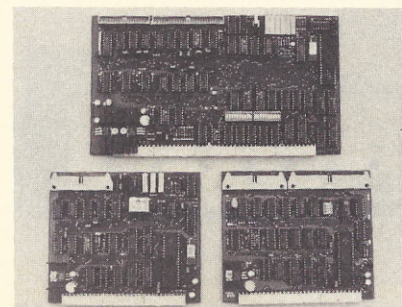


IEEE 696 specifications including 24 bit addressing which allows up to 16M bytes of system memory. It may be addressed on any 64K page boundary and can be disabled in 16K blocks. The upper 8K block can also have 2K windows disabled to allow for memory mapped peripherals. The board uses the 2K by 8-bit static RAM chips that

are pin-compatible with 2716 type EPROMs. This allows up to 32K of EPROM to intermix with the RAM if desired. The RAM 17 is available in unkit, assembled and tested, or certified system component high reliability program. Prices: \$1,095, \$1,395 and \$1,595 respectively. CompuPro division of Godbout Electronics, P.O. Box 2355, Oakland Airport, CA 94614, (415) 562-0636.

**CIRCLE INQUIRY NO. 236**

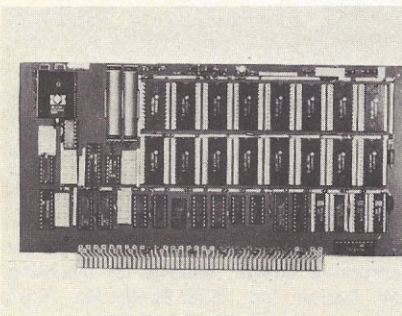
**Floppy disk controller boards** are for use in SS 50 bus, 6809 and 6800 microcomputer systems. The DMA disk controller uses high speed direct memory access for data transfers to and from system memory. It supports any combination of drives, 8-in. and 5-in.; single and double headed; single and double track (48 and 96 TPI); single and double density; up to 4 drives total. The board features both a phase-locked loop data separator and adjustable write precompensation to insure high reliability,



and can be used in 6809 systems running at 1, 1.5, and 2 MHz. The double density PIO controller supports up to four 5-in., single and double headed; single and double track; single and double density drives. The board also features a phase-locked loop data separator, and adjustable write precompensation. In systems that have slow I/O circuitry on the motherboard, it can be used at 1, 1.5, and 2 MHz. Price for disk controller: \$548; for PIO controller: \$348. Gimix, 1337 W. 37th Pl., Chicago, IL 60609, (312) 927-5510.

**CIRCLE INQUIRY NO. 237**

**Non-volatile memory boards** for S-100 systems feature high speed CMOS RAM ICs, on-board batteries, and proprietary write-protection circuitry. The result is a degree of data security approaching an EPROM board with the fast access and convenience of high speed RAM. A software



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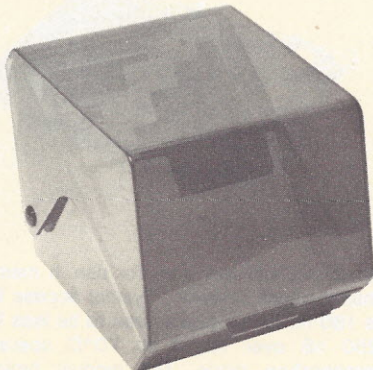
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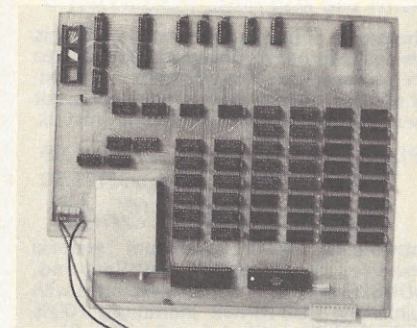
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the main power supply fails. When power is restored, the computer can resume operation as if no power failure had occurred. With access time of 250 nS, the boards run in 4 MHz S-100 systems such as North Star and Cromemco with no wait states. Other features include 8- or 16-bit data transfers, bank select option, and extended memory addressing through 24-bit address lines. The batteries are guaranteed to keep programs and data intact for one year. Prices are \$1,095 for the CMEM-32K with 32K bytes of memory, \$895 for the CMEM-16K and \$695 for CMEM-8K. Dual Systems Control Corp., 1825 Eastshore Hwy., Berkeley, CA 94710, (415) 549-3854.

**CIRCLE INQUIRY NO. 238**

**Super expansion board** is a high resolution color graphics/memory expansion board for the Ohio Scientific Superboard II/Challenger 1P computers. The SEB incorporates the following features on a 10-in. by 12-in. PC board: 16K memory expansion; eleven software selectable display modes with graphics resolution of up to 256 by 192; up to eight



user selectable colors; 6K display memory; 8-bit parallel port w/handshake. The unit is designed to mount/connect directly to the computer without any user modifications. Prices: assembled and tested, \$249 (including 5K RAM), or as a bare board w/documentation, \$59. Grafix, 911 Columbia Ave., N. Bergen, NJ 07047.

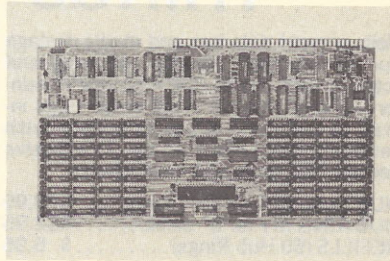
**CIRCLE INQUIRY NO. 239**

**32K static memory board** uses either 4044s, 6504s or equivalent 4K by 1 memory chips. It uses dip switch selectable addressing and I/O mapped extended addressing to 256K, organized as four 64K blocks. Each block is enabled via a bit from an output port. Any one of eight memory banks can be located in any one of sixteen 4K boundaries within a 64K block. On board battery backup system can retain data for at least 72 hours after system power has been removed. Power fail signals can be used to disable the board during power down. It has pullup resistors on all address and chip select inputs of the memory chips. It utilizes 4 MHz operation. VLSI Computer Systems, 650 S. Grand Ave., Suite 714, Los Angeles, CA 90017, (213) 623-8682.

**CIRCLE INQUIRY NO. 240**

**Memory card, Mega-4**, is multibus compatible, satisfying the large memory requirements of high performance 8-bit (8085, Z80A) and 16-bit (8086) microcomputer systems. It contains up to 512K bytes of fast read/write memory, a memory management unit (MMU), distributed refresh and full parity generating/checking circuitry. Byte-wide (8 bit) and word-wide (16 bit) data transfers are

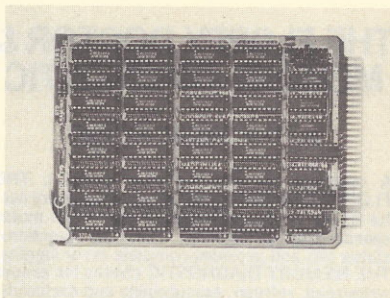
supported and an advance acknowledge signal (AACK/) is provided as a jumper option. Worst cases of access time is 625 nS with cycle time of 725 nS. The MMU consists of two identical banks of 128 address translation registers that are loaded by the system CPU(s) to specify the mapping of the 64 physical memory segments (8K bytes per segment) on board the Mega-4 into the 128 logical memory segments in the 1M byte multibus address space. Six bits in each MMU register specify the mapping of a given



segment and two bits specify the memory segment attribute (i.e. read only, write only, read/write or read/write disable). The MMU gives 8086 based systems the same segmented addressing as found in Z8000 systems. The unit is available in 32, 64, 128, 256 and 512K byte configurations and can be populated with either 16K or 64K RAMs. Matrox Electronic Systems Ltd., 5800 Andover Ave., T.M.R., Quebec, H4T 1H4, Canada, (514) 735-1182.

**CIRCLE INQUIRY NO. 241**

**Static RAM board, 16K by 8**, for the STD bus is configured as two 8K by 8 blocks addressable on any 8K boundary and will run with 4 MHz processors. Proven static design eliminates refresh and DMA problems. The STD RAM-16 uses 2114 static RAM chips and can also be populated with the Xicor

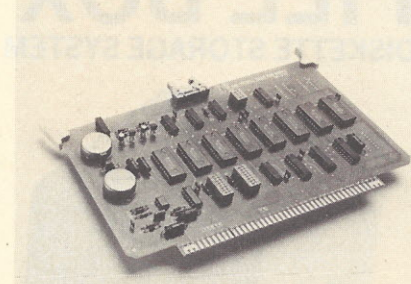


2214 shadow RAM/ROM memory chips which allows the system to have as little as 1K, or up to 16K of nonvolatile memory. It is able to respond to the memory expansion signal if greater than 64K system memory is desired. Price: \$325. CompuPro Division of Godbout Electronics, P.O. Box 2355, Oakland Airport, CA 94614, (415) 562-0636.

**CIRCLE INQUIRY NO. 242**

**Static RAM module** is designed for compatibility with the Exorciser-Micromodule microprocessor bus. The 9637 is a 16K-byte static random access module that utilizes byte-wide CMOS static memory devices supported by on-board batteries for data retention during periods when system power is absent. The data guard is generated on the card and no external signals are required

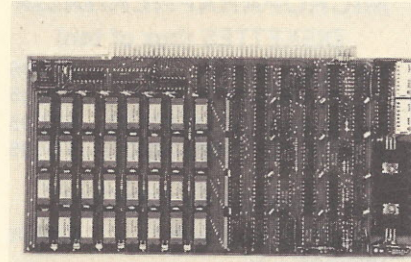
to maintain data integrity during system power transitions. It can be removed from the system chassis and transported without loss of data. The service life of the batteries is sufficient to guarantee three years of data retention before battery replacement. The module is organized as two independent 8K bytes. Each block can be selected to operate at any 8K boundary by on-board switches. The module can also decode four



additional address lines for use in memory management systems. Typical access time is 180 nS and is guaranteed to be less than 250 nS over the 0 to 70°C operating temperature range. The module typically requires 2 watts of power from a single 5 Volt supply. Price: \$595. Creative Micro Systems, 11642-8 Knott St., Garden Grove, CA 92641, (714) 898-9669.

**CIRCLE INQUIRY NO. 243**

**Memory module, CI-S100**, is designed specifically for the Sol, Cromemco, North Star, and other S100 bus microcomputers. The dynamic RAM module requires no wait states at 2 or 4 MHz. The new memory is compatible with most S100 bus microcomputers, including the Z80 at 4 MHz. The CI-S100 is designed to plug directly into the memory slots of most S100 microcomputers. Features include expandability to ½M byte with a bank select feature. This feature allows



user to select up to eight 64K-byte memory cards. On-board hidden refresh requires no outside intervention making the CI-S100 look like a static RAM to the outside world, even during block DMA write applications. It is addressable in 4K increments up to 512 bytes of memory. It is available with battery backup capability. Size is 5 in. by 10 in. Price: \$575 for 64K by 8. Chrislin Industries, 31352 Via Colinas, #102, Westlake Village, CA 91361, (213) 991-2254.

**CIRCLE INQUIRY NO. 244**

**Bubble-memory system** that is S-100 compatible is comprised of a single printed-circuit controller module and one or more bubble-memory modules. All have standard S-100 dimensions, and can plug directly into any S-100 system. The MBB-100 modules





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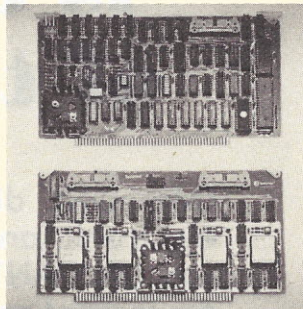
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can be housed in an external chassis. The MBC-100 Bubbl-Board controller contains its own 8-bit microprocessor and is capable of controlling up to 16 MBB-100 Bubbl-Pacs. The microprocessor handles bubble-device formatting, error-checking and control, as well as interfacing the complete bubble-memory system to the S-100 bus. The controller is full compatible with the CP/M operating system; a CP/M-type software



driver is provided with the MBC-100. Each MBB-100 Bubbl-Pac contains 46K bytes of bubble-memory mass storage. After formatting, this is equivalent to about 320 floppy-disk sectors. With six MBB-100 Bubbl-Pac modules in the system, bubble-memory storage is equivalent to the capacity of a single-density floppy disk. Prices: MBC-100 controller, \$361; MBB-100, \$772. Bubbl-Tec, 6800 Sierra Ct., Dublin, CA 94566, (415) 829-8700.

CIRCLE INQUIRY NO. 245

## DATA COMMUNICATIONS

**Telephone peripheral** for Atari model 400/800 personal computer system is a direct connect modem for interfacing the computer to the national telephone network. Direct connection eliminates the need for noisy and unreliable acoustic coupled modems. The Microconnection is Bell 103 compatible and operates in the originate or answer mode at 300 baud. It can be used for accessing The Source, MicroNet, computer bulletin boards and other computers for data transfer with hundreds of data bases in this



country and Europe. The product does not require the model 850. The modem is connected to the model 800 computer console data port and employs software for 300 baud data I/O. Exclusive features include the incorporation of a serial printer interface via a DB25 connector. Any printer, capable of 300 baud or more, will simultaneously reproduce whatever appears on the screen. Included is a terminal communications program, power source and cable for interfacing to the Atari 800. The Microconnection measures 7.7 in.

wide by 5.5 in. deep by 1.7 in. high and weighs less than one pound. Price: \$249. Microperipheral Corp., 2643 151st Pl. N.E., Redmond, WA 98052, (206) 881-7544.

CIRCLE INQUIRY NO. 246

**Multiplexer for microcomputers** transforms 2-64 micros into powerful multi-user/multi-function systems for business, financial and educational applications. Constellation allows lower cost front-end computers to share more expensive mass storage and printer peripherals. The system has a storage capacity of 10-80 million bytes. It can start with a low initial investment and be economically expanded as the user's needs grow. It operates not as a time-sharing system but as an interactive network with full computer power at each station. The system allows each computer to access the disk storage as



though it were the only one connected and will even operate with all computers active. Compatible with most popular microcomputers, it allows an intermixing of models and brands for maximum flexibility. Each computer can use its own single-user operating system with little or no modification. The multiplexer has a burst data transfer rate of 60K bytes, maximum link lengths of 50 feet and 8 bytes of lockable keys. The mean-time-between-failure (MTBF) of the Constellation is in excess of 25,000 hours. Price: \$750. Corvus Systems, Inc., 2029 O'Toole Ave., San Jose, CA 95131, (408) 946-7700.

CIRCLE INQUIRY NO. 247

**Communications option**, BiSync, allows interactive synchronous communication between mainframe, mini or microcomputers. Exactly emulating the IBM 2780 and 3780 terminals using binary synchronous protocol, transmitting in ASCII or EBCDIC code, BiSync enables data to be quickly and easily transferred via 1200-9600 baud modems over common telephone lines. Completely contained within only 15K of memory, the communications option supports check-sum error detection to automatically recognize transmission errors and immediately re-transmit affected signals. Other special features with the option include: transparency/non-transparency; compression functions to shorten records and transmission time requirements; reverse interrupt for interactive exchange between stations; unattended operator features for answering or disconnecting calls; as well as a variety of user-configurable options. Price: \$450. Phase One Systems, 7700 Edgewater Dr., Suite 830, Oakland, CA 94621, (415) 562-8085.

CIRCLE INQUIRY NO. 248

**Acoustic modem** with the direct IEEE 488 interface can be used with Hewlett Packard, Tektronix and Commodore Pet computers. IEEE/IEC functions supplied or supported by



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## Batch Update Calls

Call#	Using: File#/Name -	Field#/Name	Call: File#/Name -	Field#/Name
1:	1 TRANSACTION	1 CUSTOMER #	2 CUSTOMER	9 CUSTOMER #
2:	1 TRANSACTION	2 PART NUMBER	3 INVENTORY	1 PART NUMBER

## PROCEDURE

- 1 If QUANTITY of (TRANSACTION) EQ 0 then . . .  
SKIP
- 2 TOTAL PRICE of TRANSACTION=QUANTITY of TRANSACTION\*SELLING EACH of INVENTORY
- 3 YEAR-TO-DATE of CUSTOMER=YEAR-TO-DATE of CUSTOMER+TOTAL PRICE of TRANSACTION
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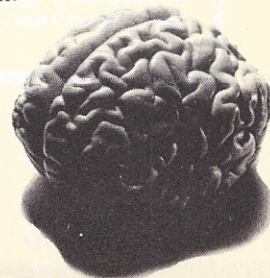
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the Star 488 are AH1, SH1, T1, L1 and SR1. Service request, initiated by a character received in the modem, is supported allowing



interrogation by a serial poll from the IEEE 488 controller in the system. The serial poll

status returned to the computer/controller contains information on modem carrier detect, overrun error (for baud rate errors) and framing error (for break indication). This modem is intended for 300 baud or 30 character per second operation only. Livermore Data Systems, Inc., 2050 Research Dr., Livermore, CA 94550, (415) 447-2252. **CIRCLE INQUIRY NO. 249**

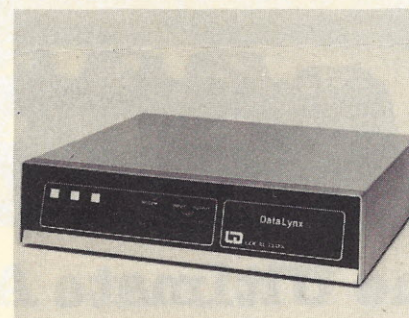
**Networking system** cuts CPU overhead, achieves throughput of more than 1M bytes and connects a variety of medium and high speed devices, with network nodes or adapters supporting mainframes and mini-computers typically attached to central processing units. The resulting network can include host processors, support processors, peripherals, mass storage systems, high speed work stations, remote job entry

stations, multiple low speed front-end peripheral networks, and gateways to remote network facilities—all via the low cost broadband medium. Key to System 40 operation are the LocalNet layered architecture and



network adapter unit, which connects user devices to the broadband network and supplies the distributed intelligence for the system. The Network Adapter is a stand-alone, 16-bit, microprocessor-controlled packet communications unit providing access to the broadband medium through software-controlled, frequency-agile transceiver with a variety of host interfaces. System 40 units will provide a unibus adapter for the DEC VAX and PDP 11 series. Standard Network Adapter units will be Intel Multibus compatible. Sytek, Inc., 1153 Bordeaux Dr., Sunnyvale, CA 94086, (408) 734-9000. **CIRCLE INQUIRY NO. 250**

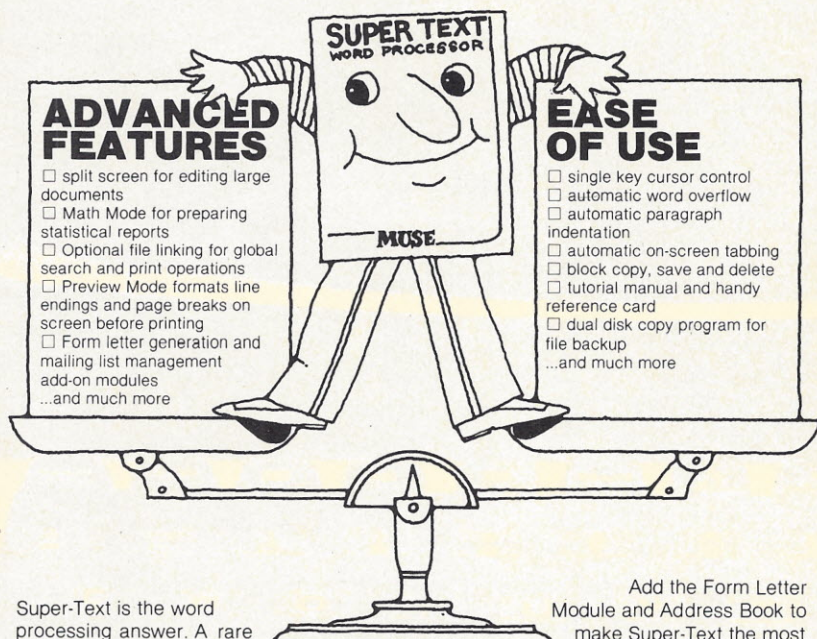
**Protocol convertor** makes ASCII terminals and minicomputers compatible with an IBM binary synchronous host, at the same time providing input, output and logical functions of more expensive bisync systems. The DataLynx protocol convertor has three input/output ports supported by an 8085A microprocessor and five RAM input/output buffers. This logic and storage capability provides or exceeds operating advantages normally found in more complex peripherals such as IBM 3780, 2780, 2770 or 3741 terminals. The convertor offers a choice of dedicated,



dial-up or auto-answer modes for remote use. It also has a standard switchable modem eliminator feature if the terminal is to be used locally via a cable link instead of remotely via a modem. The five input/output buffers, which provide a total of up to 2.6K bytes of memory, provide fully optimized overlapping of all input/output functions. This allows, for example, an attached printer to operate at its full throughput potential. At 9600 baud, a 600 LPM printer can be operating at full speed. Price: \$1,750. Local Data, 2701 Toledo St., Torrance, CA 90503, (213) 320-7126. **CIRCLE INQUIRY NO. 252**

**Serial port tester** is used in trouble-shooting data communications and data processing

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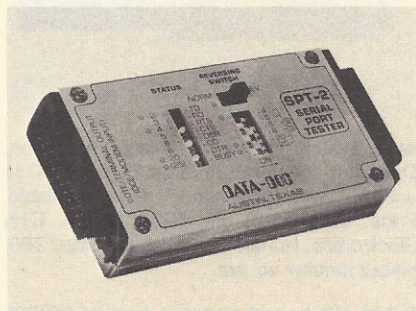
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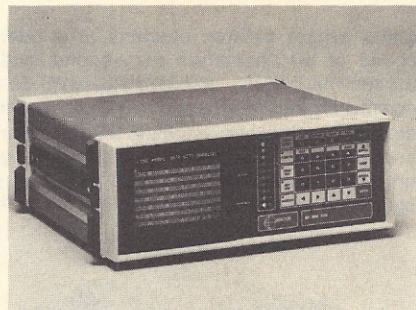
equipment. Data-Doc SPT-2 tester monitors eight of the most commonly used pins, including receive data, transmit data, data set ready, carrier detect, request to send, clear to send, data terminal ready, and busy. The device allows for jumpering in any of the other RS-232C lines for monitoring and assertion in place of the busy line. The SPT-2 has male and female 25-pin RS-232C connectors at opposite ends so it can be mounted in-line in either direction. It requires no external power and the LED display indicators draw



minimal current from monitored lines, well within RS-232C standards. Price: \$125, Data-Doc, 9415 Neils Thompson Dr., Austin, TX 78759, (512) 836-7326.

**CIRCLE INQUIRY NO. 253**

**Data monitor** eases operation and portability. Since the Mini Fox automatically detects line configuration, even when DCE and DTE speeds are different, a new operator can use it immediately. Mini Fox's standard features include on-line, full-duplex data monitoring from 50 bps to 19.2K bps; a 512-character, 5-in. CRT display; normal, reverse, and dim video capability; a 16K



capture buffer; status indicators for EIA leads; start/stop trappings; and automatic error flagging. The Mini Fox handles most standard protocols (Async, Bisync, SDLC/HDL, Transparent Text) and codes (ASCII, EBCDIC, BCD, Baudot), plus a user-selected protocol and codes. Price: \$3,495. Halcyon, 1 Halcyon Plaza, 2121 Zanker Rd., San Jose, CA 95131, (408) 293-9970.

**CIRCLE INQUIRY NO. 254**

**4800 bps modem**, Avanti 3002, provides price/performance solution for medium distance data distribution applications. It operates over unconditioned and dedicated 3002 telephone lines, loaded metallic circuits, carrier systems (analog and digital), microwave systems and multiplexer systems. Operating modes are full duplex, four wires; half duplex, two or four wires; point and multi-point. Local and remote loopback capability and diagnostic LEDs facilitate installation and checkout. A fallback rate of 3600 bps provides reliable operation when lines become marginal. A dual channel feature,

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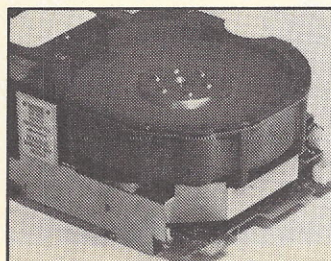
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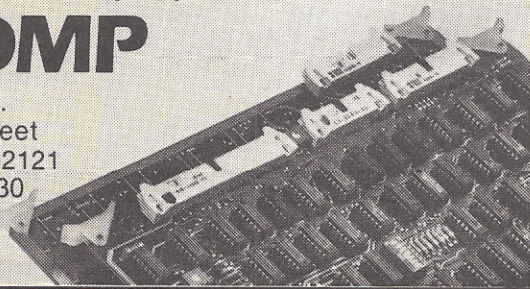
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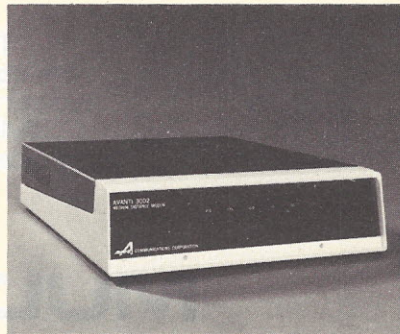
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standard to the Avanti 3002, allows two terminals to operate independently at 2400 or 1800 bps with a single modem. The asynchronous option allows either a single 4800/3600 or dual 2400/1800 terminal(s) to be



connected directly without the need for external asynchronous to synchronous converters. Price: \$1,395. Avanti Communications Corp., Aquidneck Industrial Park, Newport, RI 02840, (401) 849-4660.

CIRCLE INQUIRY NO. 258

**300 bps modem** operates over all dial telephone lines, even those not usable by line powered units. A Data/Talk switch selects data or talk modes. An indicator for Data Flow and Carrier Detect shows transmit and receive data activity, and indicates that a call is established with another modem. Answer and originate mode is automatically selected, making it unnecessary to select operating mode. An indicator shows in which mode the modem is operating. The 103J-L features



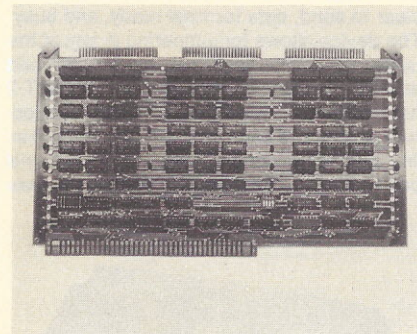
self-diagnostics which loops data from the terminal through the modem to check operation. For installation, the modular plug from the phone connects to a jack in its rear panel. A standard 6-pin connector from the modem access the telephone line. Business equipment connects to the modem with an EIA 25-pin RS-232C connector. Price: \$199. General DataComm Industries, Inc., One Kennedy Ave., Danbury, CT 06810, (203) 797-0711.

CIRCLE INQUIRY NO. 259

## I/O

**Expansion board** allows unusual flexibility and simplicity for interfacing digital I/O to any Intel Multibus compatible computer system. Designed for industrial applications, the SBS-520 features high-speed operation, low-power consumption, diagnostic capability and direct interface to several solid-state modules and I/O systems. A total of 72 TTL I/O lines and three external interrupt inputs are provided. The nine 8-bit ports are I/O mapped with switch-selectable base address

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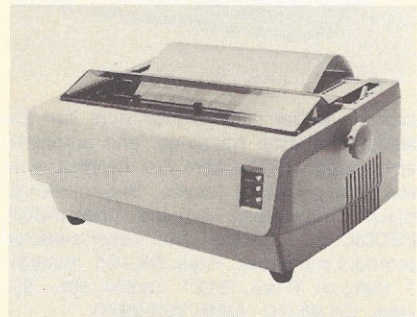
as a system to insure reliable operation. Operating temperature range is from 0°C to +55°C with extended range available. Price: \$365 (1-9) and \$285 (100s). CTN Electronics, Ronald Smith, (606) 342-7200.

CIRCLE INQUIRY NO. 260

**S-100 I/O board** features 4 serial RS-232 I/O ports with independent baud rates of 50 to 19,200 baud, 24 bits of parallel I/O configurable into up to 4 independent ports, 5 independent multi-feature timer counters, 16 levels of vectored interrupt control for on and off board sources, and an optional battery powered real time clock/calendar that includes 50 bytes of general purpose low power RAM. The MFIO is designed for applications requiring multiple I/O ports, timing and interrupt services, and combines on one board the features necessary for control of a multiuser system. Digicomp Research, Terrace Hill, Ithaca, NY 14850, (607) 273-5900.

CIRCLE INQUIRY NO. 261

**Daisy wheel printer** operates at a print speed of 40 characters per second, and utilizes the industry standard RS-232C EIA communications interface. The 40 cps model employs an industry-standard 96-character print wheel. It produces letter-quality printing on three copies with either 136 columns in pica pitch or 163 columns in elite pitch. It



also offers vertical and horizontal placement. The printer handles forms up to 15 inches wide. It also features self-test capability, programmable VFU and front panel indicator lamps for paper, select and power status. C. Itoh Electronics, Inc., 5301 Beethoven St., Los Angeles, CA 90066, (213) 390-7778.

CIRCLE INQUIRY NO. 262

**Impact printer** uses a single rugged print hammer. The GP-80M, which prints both graphics and alphanumerics, employs a rotating platen with protruding splines positioned behind the paper. The character or graphics image is created by multiple



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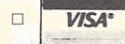
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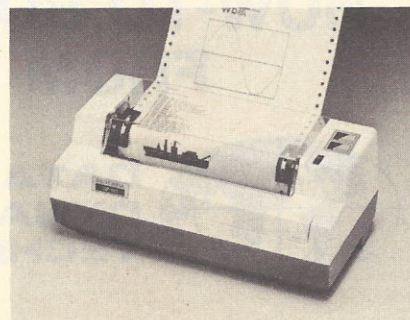
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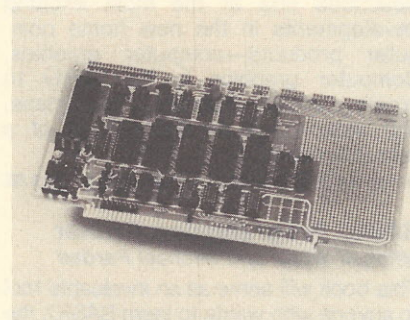
hammer strikes in rapid succession. The precision gear train assures the exact positioning of the print hammer relative to the splines on the platen, and uniformity of the 5 by 7 dot matrix pattern. Standard features include ASCII upper and lower case



character sets, up to 80 columns with 12 characters per inch, adjustable tractor feed, three copy reproduction, 12 watt power consumption, and Centronics parallel interface. It also has full graphics capability with a resolution of better than 60 dots per inch in both horizontal and vertical axes. Dot graphics, normal characters and double width characters can be intermixed on a single line under software control. Price: \$399. Axiom Corp., 1014 Griswold Ave., San Fernando, CA 91340, (213) 365-9521.

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**I/O board** for S-100 bus systems features 4 separate serial channels and 5 parallel ports. This versatile board, the Multi I/O, is utilized in Micromation's single and multi user M/Net multi-CPU system. Each of the four serial ports consists of an 8251 universal synchronous asynchronous receiver transmitter with individually selectable baud rates. In typical applications, the baud rates start at a high of 9600 bps with subsequent decrements derived by dividing by two to a low of



600 bps. Other rates can be acquired under software control, however, to accommodate faster or slower peripherals. Each port can be jumpered to any of the 8 vectored interrupt signals if interrupt driven I/O is necessary. Other features include a substantial wire wrap area for custom applications, jumper selectable addressing (between 00 and FF in 32-byte blocks) to prevent address conflicts with other boards in the system, an 8253 programmable timer with two unallocated outputs available for special functions and complete documentation. Micromation, Inc., 1620 Montgomery St., San Francisco, CA 94111, (415) 398-0289.

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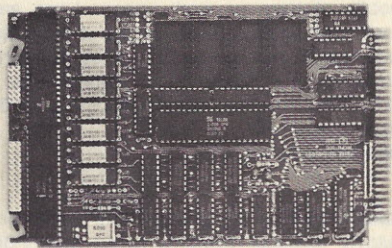
**STD bus card** is 4.5 by 7 inches. The heart of the MCPU-800 single board microcomputer is a 4 MHz Z80A microprocessor. No

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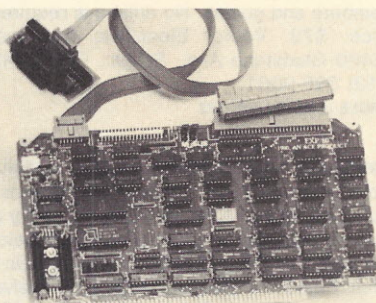
wait states are necessary when used with on-board RAM and 350 nS access time ROMs. Four sockets are provided for 8K to 32K EPROM or ROM. 24-pin 2K, 4K, and 8K ROMs and EPROMs are easily accommodated with on-board jumpers. 0 to 64K bytes of dynamic RAM may be used on the MCP8U-800. Sockets available will accept triple supply 4116, or single supply 4516,



4132, and 4164 type RAMs. The 64K RAM and 32K ROM coexist on the MCP8U-800 through a memory mapping scheme. 16K blocks of RAM and ROM may be selectively enabled or disabled by software via a memory map port and its associated bipolar PROM. The machine typically requires 1 amp at 5 volts for a 16K, 32K, or 64K system without ROMs. The 16K system utilizing 4116 type RAMs also requires +12 and -5 at 160 mA. Prices start at \$675. Miller Technology, 16930 Sheldon Rd., Los Gatos, CA 95030, (408) 395-2999.

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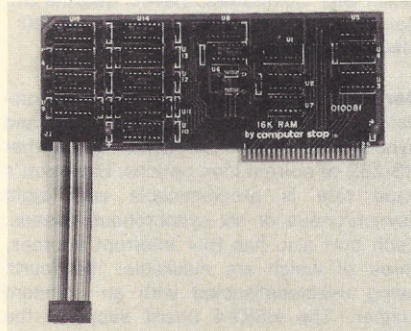
**Expansion board** enhances the networking capability of the MuSYS Net/80 single board slave processor. Net/80 contains: Z80A CPU, 64K bytes of RAM and an RS232 serial port for the local console. EXP/80 adds the features necessary for a data processing network master to run the MP/M operating system. Features include an additional console port, priority interrupt control, real



time clock, serial or parallel printer support and IEEE S-100 bus master capability (as permanent master) for accessing disk controllers or other peripheral over the S-100 bus. The parallel port can be used to support a Centronics type printer or to provide 8 bits of input and output data for alternative uses. An additional serial port permits interface with a serial printer. Standard interrupt configurations are available via jumper plugs on the AM9519A Priority Interrupt controller. Wire wrap connections can be made to achieve special interrupt configurations. In the master mode, the S-100 bus interrupt lines are available as interrupt sources. Price: \$295. MuSYS Corp., 1451 Irvine Blvd., Suite 11, Tustin, CA 92680, (714) 750-5693.

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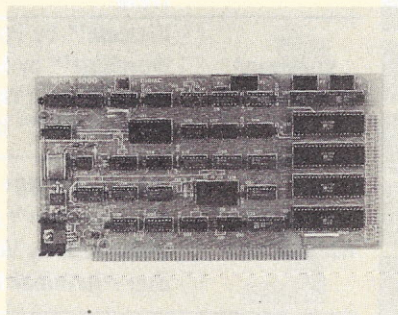
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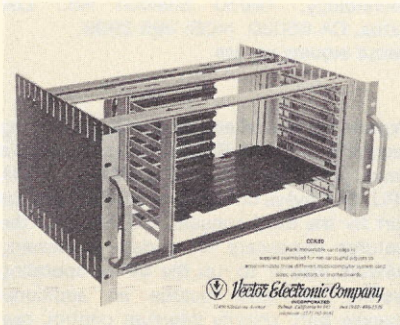
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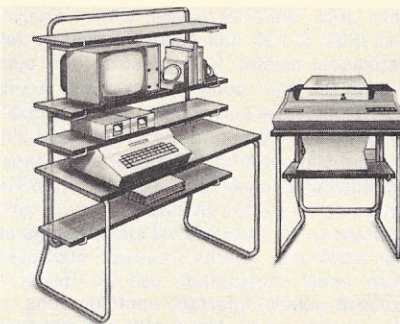
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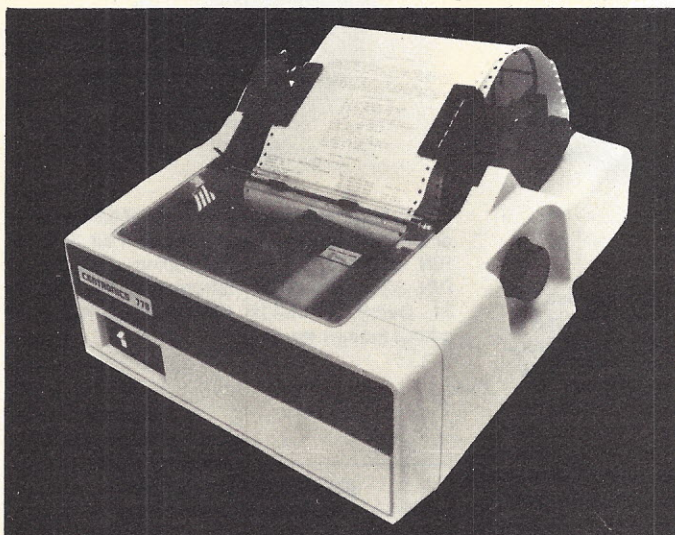
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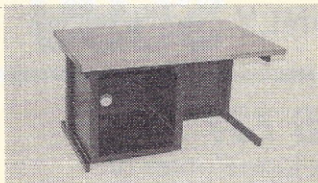
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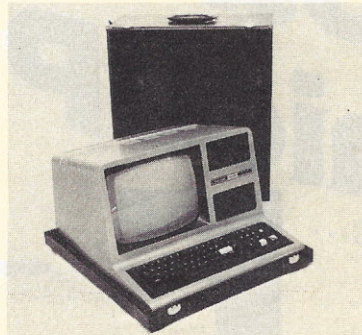
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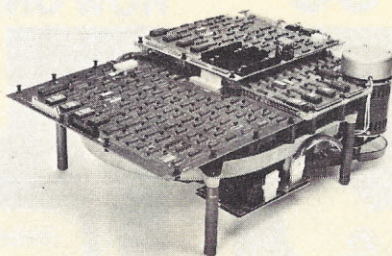
**Computer cases** include the AP104 for the Apple III which holds the computer, two additional disk drives and a Silentype printer retailing for \$139; the AP105 for a monitor such as the Sanyo or Leedx 13-in. retailing



for \$99; the RS204 for the TRS-80 model III retailing for \$129; the RS205 for the Radio Shack color computer retailing for \$99; and the P403 for the Epson MX80 and MX70 printers also retailing for \$99. The cases are constructed of luggage material with hard sides, padded handles, brass hardware and key locks. Rubber pads provide furniture protection and steel lugs on the bottom protect the case when transporting. Tops are removed so that the equipment can be operated without removal from the case. Provisions are made for cords to exit the case even when the top is on and locked. Computer Case Co., 5650 Indian Mound Ct., Columbus, OH 43213, (614) 868-9464.

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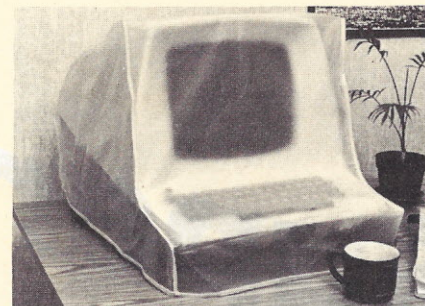


Marksman interface option that provides the user an efficient and cost effective means of attaching the drive to the host CPU. Century Data Systems, 1270 N. Kraemer Blvd., Anaheim, CA 92806, (714) 999-2660.

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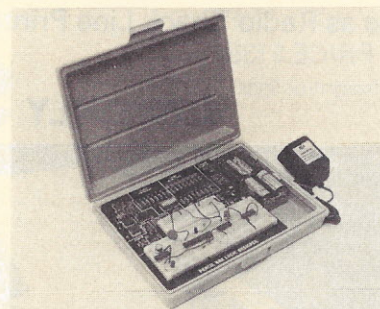
1029, 2465 Augustine Dr., Santa Clara, CA 95051, (408) 727-1970.

CIRCLE INQUIRY NO. 276

**5¼-in. Winchester family** offers three capacity disk drive options, two interface choices and an innovative mechanical design. The SA600 series comes in three versions: the single-plotter SA602 with 3.33M bytes of (unformatted) storage capacity, the double-plotter SA604 with 6.66M bytes, and the 10M-byte triple-plotter SA606. Key performance specifications include an average access time of 75 mS (160 maximum); transfer rate of 4.34 megabits per second (the same as that of the SA1000 8-in. Winchester); track-to-track access time of 18 mS (including settling); and track density of 256 tracks per inch. Shugart Assoc., 475 Oakmead Pkwy., Sunnyvale, CA 94086, (408) 733-0100.

CIRCLE INQUIRY NO. 277

**Logic designer**, LD-1, includes major design needs in a handy portable molded plastic case with integrated hinged cover. Features include a variable clock, two pulsers, eight LED readouts, eight logic level switches and the SK-10 solderless breadboarding socket.



Power is supplied through the use of batteries or an optional AC supply. Prices: LD-1 kit, \$75, P/N 325-4301; LD-1/assembled, \$99.50, P/N 325-1301. E&L Instruments, 61 First St., Derby, CT 06418, (203) 735-8774.

CIRCLE INQUIRY NO. 278

## PERIPHERALS

**Desk-top printer**, Model 150, is designed for business and communications applications. Standard features include 3-way paper handling, top of form, compressed print, adjustable tractors and a roll paper holder. Additional features include 150-cps print speed, bi-directional logic-seeking printing,



"clean hands" ribbon cassette, forward tear bar, self-test, and a visual paper empty



indicator. Centronics Data Computer Corp., Hudson, NH 03051, (603) 883-0111.

CIRCLE INQUIRY NO. 280

**Block-mode display terminal**, the HP 2622A, provides increased memory, display enhancements, screen-labeled user-programmable keys, an optional line drawing character set and an optional thermal printer. Format mode, supporting protected and unprotected fields, and the optional line drawing character set enable users to build screen forms that match existing paper forms. Four standard



display enhancements—reverse video, underlining, blinking and half-bright—help make forms easier to read. Standard memory accommodates up to two full pages of 80-character lines, enabling two-page forms to be entered. Price: \$2,075. Hewlett-Packard, 1501 Page Mill Rd., Palo Alto, CA 94304, (415) 857-1501.

CIRCLE INQUIRY NO. 281

**16-bit intelligent terminal** is optimized for word-processing and office automation applications. With its high-performance 8086 microcomputer and CP/M 86 operating system, the terminal permits extensive local processing of information, plus fast response



time when operated on-line from a host computer. The model 1000 terminal, with its full-page 66-by-80 character video display, 64K

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bytes of RAM and 8K bytes of PROM, is ideal for adding word-processing capability to a host computer of any size from a micro-computer to large mainframes. The same features also make it excellent for data processing, suiting the terminal for the exploding office automation market. The terminal's full page video display utilizes a 7 by 9 dot matrix in a 9 by 15 field for attractive, easy-to-read characters. Any combination of 128 ANSI characters, including upper and lower case with descenders, can be displayed in high or low intensity with blinking, reverse, blank and underline capability. The detachable keyboard consists of a full alphanumeric set of 107 keys with N-key roll over. The keyboard also includes eight function keys that can be programmed for user convenience. Piiceon, Inc., 2350 Bering Dr., San Jose, CA 95131, (408) 946-8030.

CIRCLE INQUIRY NO. 282

**Laser data terminal**, MS123, has a laser bar code scanner, a 16-pad keyboard, a 24-character display, and a 21-column matrix printer. The unit is a stand-alone, interactive data entry system with the added feature of laser scanning for speed and reliability. The operation is similar to a video data terminal in its communications through RS-232 with a computer. Uses are stockroom control, production ticket tracking, shipping and receiving, document control, and other human interactive data entry points. The

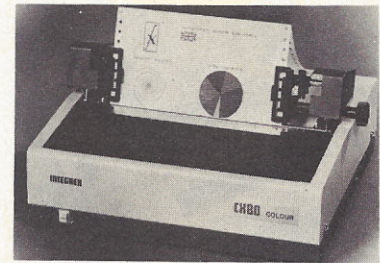


laser is a helium-neon, steel-ceramic, hard-seal unit offering shock resistance and longer life. The laser is a safe, Class II BRH type. The 21-column, dot matrix printer provides a printout for tickets, receipts, date due slips, production tickets and other uses requiring hard copy. The printer, keyboard and display are programmed through customer provided ROM of the 2716 type. They can be accessed from an external computer. Metrologic Instruments, 143 Harding Ave., Bellmawr, NJ 08031, (609) 933-0100.

CIRCLE INQUIRY NO. 283

**Color matrix printer** requires no special absorbency paper. The CX-80 can print text, graphs, histograms and color VDU dumps in seven different colors, with no restriction on mixing characters, dot-addressed areas and color changes on the same line. Colors are selected by 1 of 7 color control codes. Stripes from the tricolor ribbon are selected to produce the required colors, which simplifies the host program requirements. Unlike ink-jet printers which require high absorbency paper, the printer uses plain white-edge perforated paper (4-10 in. wide). The unit is fully dot addressable in all 7 colors; the character ROM contains 96 ASCII and 64 graphics characters. The

7-wire head produces a character format 5 by 7 plus graphics format 6 by 7. Integrex



Inc., 233 N. Juniper St., Philadelphia, PA 19107, (215) 627-0966.

CIRCLE INQUIRY NO. 287

**Disk controller board** for the Apple computer, the Lobo LCA-22, is completely software compatible with Apple DOS and contains 256 bytes of onboard boot ROM. It will control up to four 8-in., single or double



sided, single or double density disk drives with a total storage capacity of 4.4M bytes. Additional features include an average access time of 200 mS and a DMA designed for full 62.5K byte/sec transfer rate. The LCA-22 has been designed to run in slots 1 thru 7, and is not restricted to a single location. Price: \$699. Lobo Drives Int'l, 354 S. Fairview Ave., Goleta, CA 93117, (805) 683-1576.

CIRCLE INQUIRY NO. 288

**Line printer spooler** for the TRS-80 model I, LPSPool, permits concurrent printing and processing. Features include: increased computer throughput by allowing printing to be done while the computer is used for other purposes; multiple copies of output may be produced automatically, without user program changes; output may be held until a more convenient time for printing, or deleted if not required; parallel or serial printers are supported. Racet Computes, 1330 N. Glassell, Suite M, Orange, CA 92667.

CIRCLE INQUIRY NO. 289

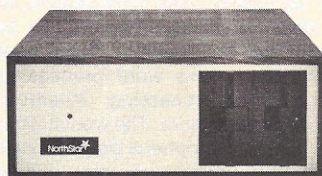
## SYSTEMS

**Office workstation**, series 1000, features the 8086 16-bit microprocessor. The 1000 is a multi-functional system designed to serve either as a stand-alone unit or as an intelligent programmable terminal in a network of office automation products. The standard system includes a console with 15-in. display, a unique display aimed at the combination WP/DP application that incorporates 39 lines of 96 characters with 256 characters per line available under automatic



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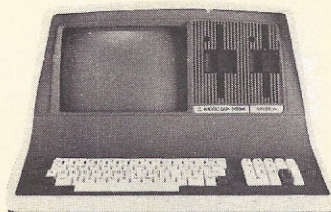
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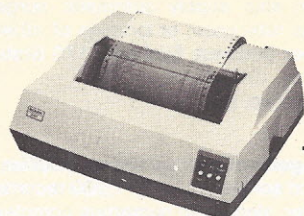
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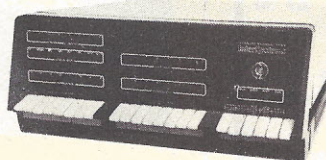


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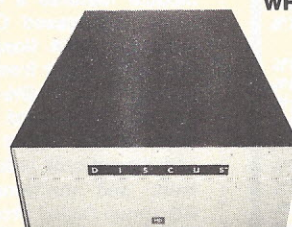
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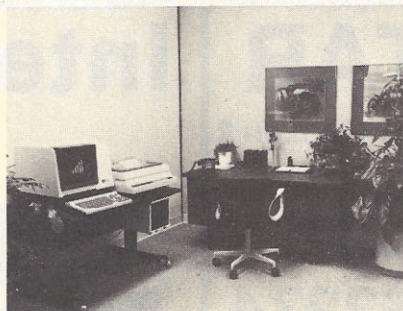
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CIRCLE INQUIRY NO. 23

horizontal scrolling; detached keyboard; and two double density 8-in. floppy disk drives housed in a separate cabinet; also available as an option is high resolution graphics. In addition to the display, the console houses the system's 16-bit CPU, I/O and communi-



cation controllers, and 64K bytes of memory. Memory can be expanded to include up to 832K bytes of RAM. Artelonics Corp., 2952 Bunker Hill Lane, Santa Clara, CA 95050, (408) 727-3071.

CIRCLE INQUIRY NO. 290

**Stack-oriented system,** PDQ-3, features direct execution of UCSD Pascal version III.0 p-code, the most widely-used microprocessor developmental language in existence today. It incorporates the Q-Bus, an industry standard, which permits addition of a wide variety of peripherals, including Winchester and 80 to 300M-byte Control Data Corporation disc drives. In addition to the 16-bit stack-based processor, the CPU module features a real-time clock interval timer, multiplexed CRT and serial printer interface, DMA floppy disc controller and bootstrap loader from floppy or hard disc, all packaged on an 8½-in. by 10-in. multilayer printed circuit board. The UCSD Pascal base offers a high degree of software portability, and dramatically reduces software development and maintenance. Price: \$6,995. Advanced Digital Products, 7584 Trade St., San Diego, CA 92121, (714) 578-9595.

CIRCLE INQUIRY NO. 291

**S-100 computer,** Expander, requires only a video display and media storage for operation. The unit, however, does not require a separate terminal, providing high speed operation. The computer is built around a single board that contains a Z80A CPU, keyboard circuitry, interrupt, video circuitry, real time clock, parallel printer interface, RS-232 serial interface, and full color circuitry. Features include standard 80 by 24



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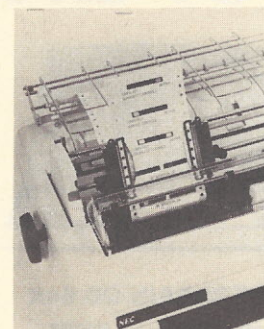
speaker. Keyboard capabilities include calculator keypad, 2 programmable function keys, and 4 cursor control keys. The high quality typewriter-like keyboard lets secretaries feel right at home. Micro-Expander, 6835 W. Higgins Ave., Chicago, IL 60656, (312) 792-1196.

CIRCLE INQUIRY NO. 292

**Small business computer,** the CT-80, boasts multi-user, multi-tasking, operating capability. By adding video workstations, as many as three business programs can be entered and run concurrently. Small businesses can time share word processing, accounting, order processing, inventory, forms processing and more. The workstations can share common peripheral devices. High level language processors are utilized including Fortran, Basic, Pascal and Cobol. A complete turnkey system for ease of operation and learning is offered. Digiac Corp., 175 Engineers Rd., Smithtown, NY 11787, (516) 273-8600.

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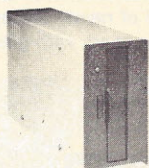
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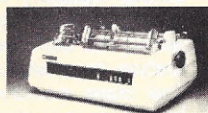
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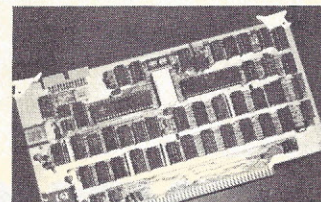
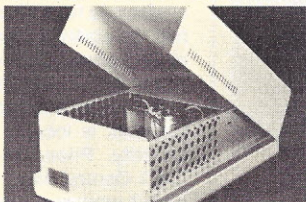
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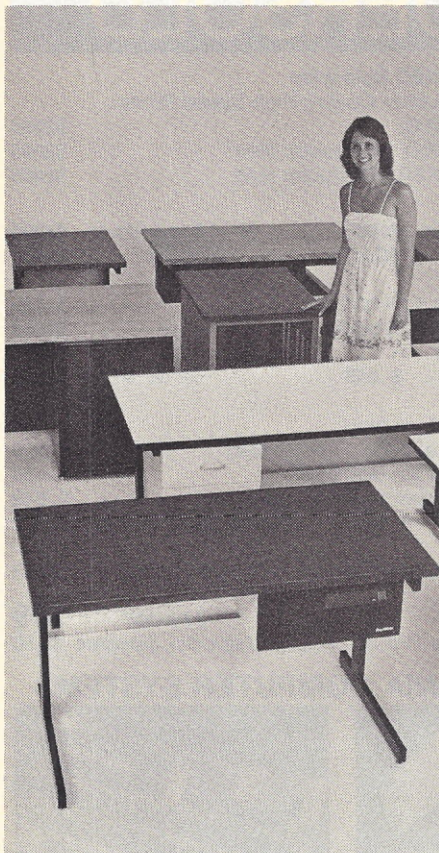
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advanced graphics capability to create line, curve, bar and pie charts for clarity and impact in reports or presentations. The system's speed can be attributed to the 5 1/4-in. dual-drive flexible disc and its random access capability. Random access enables users to immediately jump to the file of your choice and store, retrieve, sort, modify and analyze large amounts of data. The disc's dual mass memory holds 270K bytes of random access storage per drive for a total of 540K bytes of memory. Prices: HP83—\$2,500; HP85—\$3,250; HP 82901M dual drive disc—\$2,500; IMPac software—\$200; mass storage ROM—\$145. Hewlett-Packard, 1501 Page Mill Rd., Palo Alto, CA 94304, (415) 857-1501.

CIRCLE INQUIRY NO. 295

**Fixed disk system**, Discus M20, for S-100 bus microcomputers, runs under CPM. The system features a Fugitsu 2302 Winchester style 8-in. hard disk drive with a data transfer rate of up to 600,000 bytes per second. The system delivers a full 20M bytes of formatted storage (234M bytes unformatted) and may be expanded up to 80M bytes by daisy-chaining up to four disk drives. A single board, S-100 intelligent controller supervises all data transfers between the host and the M20 system via four I/O ports. The controller also has the ability to generate system interrupts at the completion of each data exchange command. In addition, a 512-byte sector buffer, with each sector individually write protectable, is located on-board for data base security. Price: \$4,795. Morrow Designs, 5221 Central Ave., Richmond, CA 94804.

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**Terminal system** lets the operator touch the display screen to select the computer's next action. The system combines a touch input screen with a CRT terminal. The touch input system measures the position of a finger touch on the CRT display, and transmits a position code to the host computer controlling the TST-40. Application areas for the TST-40 include management information systems, where an executive needs an immediate response from a data base without having to know system commands or how to type. In medical data



base applications a patient can enter his own medical history by answering a series of questions without training and with a frankness that may be unobtainable with a medical interviewer. Medical staff can access the data without extensive system training. TSD Display Products, Inc., 35 Orville Dr., Bohemia, NY 11716, (516) 589-6800.

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**Computing system**, series 2000 model 4, is a fully self-contained computer system

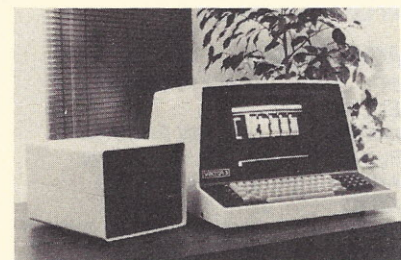
which includes a high-quality 25 by 80 CRT display, full ASCII keyboard with many special function keys for user-defined functions, 2 MHz 68B00 CPU, 64K bytes of RAM, integral with 736 K bytes of formatted data storage capacity. Up to 3 additional drives may be added for a total of nearly 3M bytes of online floppy disk. For users with greater



storage requirements, Winchester disks of 5, 10, and 20M-byte capacity are available. Four major operating systems are available for the model. MTS, Pascal, Forth, and FLEX give the user free choice between assembly language development, structured programming, and high-performance interactive data processing capability. Electronic Tool Co., 4736 W. El Segundo Blvd., Hawthorne, CA 90250, (213) 644-0113.

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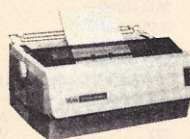


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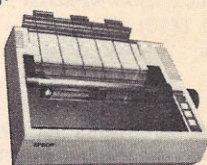
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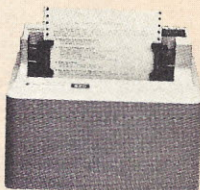
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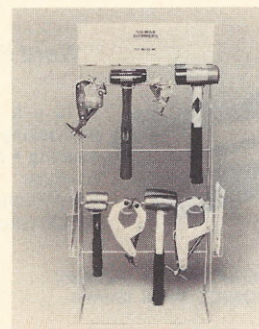
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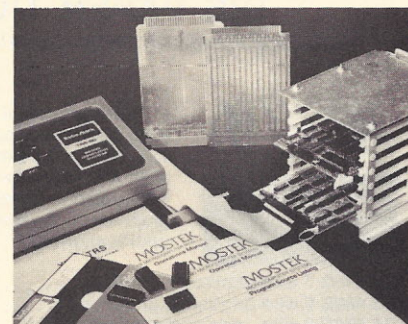
have fiberglass handles with rubber grips optional. Also the "z" hex wrench for both fractional and metric screws is added. Clamp Manufacturing Co., Inc., 1503 Adelia St., S. El Monte, CA 91733, (213) 579-5379.

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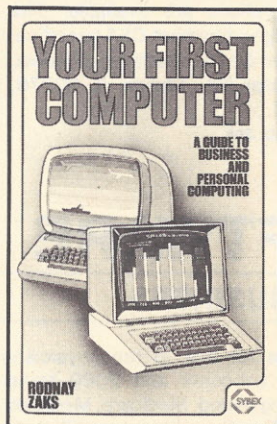


system in ROM; and floppy diskette (5¼-in.) containing driver software for the TRS-80. The package is available in both a 2.5 MHz configuration and a 4.0 MHz configuration. Both systems operate from a single +5V supply and may be used with any of the more than 100 different STD bus compatible I/O cards. Price: \$895 for 2.5 MHz and \$1,040 for 4.0 MHz. QC Microsystems, P.O. Box 401326, Garland, TX 75040, (214) 343-1282.

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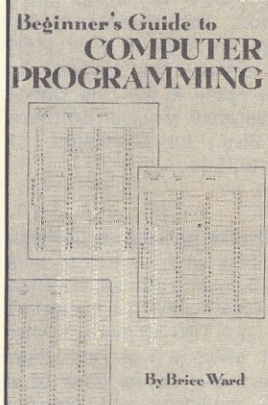
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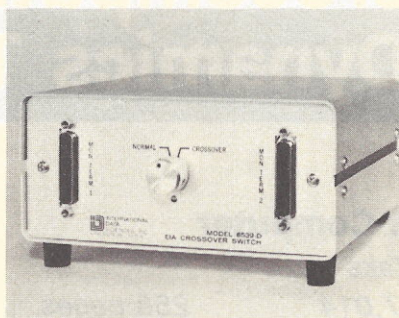
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CIRCLE INQUIRY NO. 106

128 INTERFACE AGE

**EIA crossover switch** allows the operator to exchange two terminals with two modems. The entire 25-line interface is switched. All interface connections are made at the rear panel of the module. Two 25-pin connectors mounted on the front panel allow monitoring



of each modem-terminal interface. The dimensions of the model 8539-D are 7 in. W by 3 in. H by 7 1/2 in. D (17.8 cm W by 7.6 cm H by 19.1 cm D) and the unit weighs approximately 2 pounds (0.91 Kg). Price: \$350. International Data Sciences, Inc., 7 Wellington Rd., Lincoln, RI 02865, (401) 333-6200.

CIRCLE INQUIRY NO. 303

**Monitor** is designed for the TRS-80 model I. Fully compatible with level II Basic and all popular disk operating systems, Tasmon incorporates a disassembler, complete with labels and all standard monitor commands. Available are a variety of input/output choices. Tracing and memory modification are facilitated, and other programs in memory can be relocated on command. Tasmon comes with over 40 pages of written documentation. Some features include: computes starting, ending and transfer addresses with optional loading to memory and optional offset to avoid conflicts with programs already in memory; allows interfacing with user routines; has all standard monitor commands; supports upper and lower case; supports any combination of I/O between disk, memory, printer and tape for system programs or disassembly; hexadecimal addition and subtraction; memory can be searched for up to 4 contiguous bytes; 9 interactive breakpoints; program can be traced by either single stepping or continuously with 8 selectable speeds; calls can be stepped through or executed in full; while single-stepping you may skip the current instruction or backup to the previous one. The Alternate Source, 1806 Ada St., Lansing, MI 48910, (517) 487-3358.

CIRCLE INQUIRY NO. 304

**Single unit module** enables safe, transient-protected and compatible data transmission



between RS232C DCE/DTE devices. The OPTO232 series solves ground loop inter-

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CIRCLE INQUIRY NO. 305

## SOFTWARE BUSINESS

**Billing system** for one to ten physicians handles 7000 accounts and 2000 transactions per billing period. Medicare, Medicaid, Medi-Cal, and Blue Cross forms are filled out at the touch of a key by Med-Apple. The insurance companies can be billed daily, weekly, or monthly at the doctor's discretion. Up to 300 charge (RVS) codes can be defined to the system by the doctor(s). These charges can be used for services, supplies, lab, X-rays or any items the patient is to be billed for. At the end of the month a report is generated which shows M-T-D, and Y-T-D activity of any particular charge code. Reports can be generated at any time to show physician activity for amounts billed and cash receipts. The system also includes automatic 30, 60, 90+ day aging with a delinquency report. The minimum system requirements are an Apple II Plus (48K) with three disk drives. The system also operates on the Apple III and the Corvus hard disk. Professional Medical Software, 3604 Foothill Blvd., La Crescenta, CA 91214, (213) 248-2884.

CIRCLE INQUIRY NO. 307

**Accounting software package** is designed for the management and control of mini-warehouse or self-service storage facilities. Mini-Warehouse System (MWS) is compatible with the Radio Shack TRS-80 model II when run under CP/M. MWS is a general ledger accounting system that keeps track of all income and all expenses and provides accounting information with a trial balance, balance sheet, profit and loss statements, budgeting. Additional financial information is immediately available at all times from the system. The system stores information on tenants that can be recalled at any time to be viewed on the screen or printed. A 12-month rent receipts history is kept for each unit, along with name, address, telephone number, monthly rent, security deposits and additional fields that are user defined. Tenants can be billed showing current status, arrears, balance due and a late charge can also be added. The package will produce exception reports like a list of delinquent tenants, vacant units, move-in dates, etc. A checkwriter that automatically prints vendor names and addresses on the checks is included. Major vendors can be entered into the system showing their name and address, telephone

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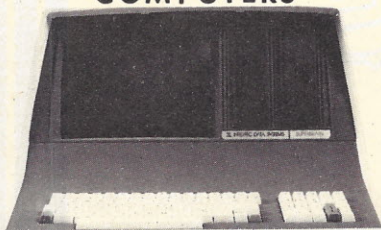
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CIRCLE INQUIRY NO. 308

**Client write-up system** for CP/M based systems targets the certified public accountant. The general ledger system includes a video journal entry program with automatic paging, on-line account verification, automatic journal balancing and control over nine separate journal books. The working reports generated include a general ledger detail, working trail balance and general ledger summary. Reports can be directed to a VDT screen or printer. Report headings, titles and format are under user control through the master chart of accounts. More than 21 financial reports and 26 supporting schedules are available in either hard copy or video screen presentations. Micronetics, Inc., 1926 Hollywood Blvd., Suite 328, Hollywood, FL 33020, (305) 925-2333.

CIRCLE INQUIRY NO. 309

**Basic text editor** provides full screen text editing of level 2 or disk Basic programs. The editor's four operating modes and 31 easy to learn commands can double programmer productivity. The cursor can be moved to any position on the screen, which can be scrolled up or down through the program text. Characters can be inserted, deleted, or changed and it is also possible to insert, delete, copy, or move entire lines or blocks of lines. Line number references are automatically updated throughout the text as such changes are made. Also provided are global search and change commands and 26 user-definable macro keys. It is available for TRS-80 model I (\$24.95) and model III (\$29.95). Computer Applications Unlimited, Box 214, Rye, NY 10580.

CIRCLE INQUIRY NO. 310

**Modular editor/assembler** for the TRS-80, M-ZAL, is available for the model I (M-ZAL-T1) and the model 3 (M-ZAL-T3). The disk based package includes full screen option menus, full screen text editor, and object module linker. The assembler produces system tapes, CMD files, and relocation/external symbol files. The object module linker allows the user to relocate independent program modules and link them together, thus creating larger and more complex programs. Source programs are not limited by memory size and can also be linked together via the assembler's \*INCLUDE command. Extensive listing control features are supported, as well as 8 character labels and an alphabetical symbol table and cross-reference. Price: \$149. Computer Applications Unlimited, Box 214, Rye, NY 10580.

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**Mailing label** and filing system is a 3-part system that is extremely dynamic and allows you to manipulate your files in dozens of ways. Features include: user-formatted definition of files (up to 18 fields); binary sorting (find a record by name in 1-2 seconds); alphabetical directory of all files (read it starting with any letter in the alphabet, and in reverse); COUNT/SORT (pull a certain population from the file, display, print out complete records, or print mailing labels); special practice mailing label program; edit section (includes delete with special hole-plugging feature); 2 types of back up programs; optional "slug-line" for your mailing labels (also optional "Contact Person" or "Position" lines); COUNT/SORT using as many as 9 variables with as many as 9 values for each, plus 3 optional range-sorts; automatically-run variables text file (keeps track of your formatting and the total number of records entered); slot and drive are user formatted; and up to 980 records on a disk. Price: \$59.95 Avant-Garde Creations, Box 30160, Eugene, OR 97403, (503) 345-3043.

CIRCLE INQUIRY NO. 312

**Filing system**, Video Librarian, is designed to end the headaches of maintaining an up-to-date accurate file of video cassette programs and tapes. The program can handle plot summaries, movie ratings, editing codes, running lengths, audience rating codes, hard copy print-outs, personal notations, and more. Video Librarian stores hundreds of titles and lists out by over fifteen individually retrievable variables. It can even perform some calculations to save valuable tape time by helping you distribute your taped programs more efficiently on cassettes. Price: \$20. Softronix, Suite 1000, 4600 Park Rd., Charlotte, NC 28211, (704) 334-1958.

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**Word processor**, Letter Perfect, is character-oriented and runs on an Apple II and Apple II Plus with DOS 3.3, with 40/80 columns. Fast action (machine language), menu-driven, single load program, with 34K free, it requires Paymar LCA, one disk drive, and 32K memory. Includes one time configuration for your system, printer type, etc. and can be reconfigured at any time. Includes right hand justification and supports incremental spacing, underlining, boldface with NEC or Qume/Diablo. It will use the special print characters of any printer. Key codes make mnemonic sense for easy use. All text is packed during saving for greater disk storage capacity. Includes full typewritten page of buffer space for easy manuscript editing. Screen format allows you to preview printed text. Price: \$150. LJK Enterprises, Box 10827, St. Louis, MO 63129, (314) 846-6124.

CIRCLE INQUIRY NO. 314

**Keyed file system** for the TRS-80 models I, II, and III, KFS-80, provides the Basic programmer with the ability to rapidly insert or access keyed records in one or more data files. Features include: easy to use Basic interface; records are maintained in sorted order by a specified key; records may be inserted or retrieved by supplying the key; records may be retrieved sequentially in sorted order; binary tree index system provides consistently rapid access to any file, regardless of the number of records; and multiple index files can be easily created



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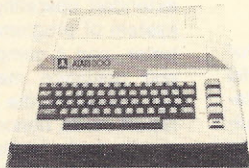
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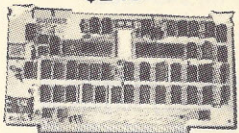
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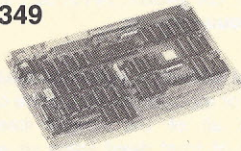
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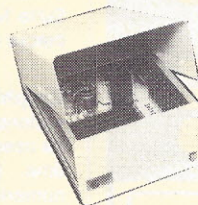
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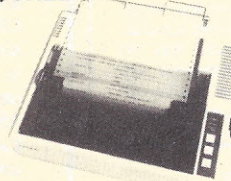
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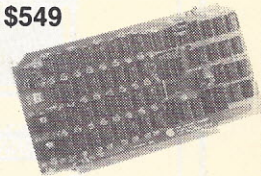
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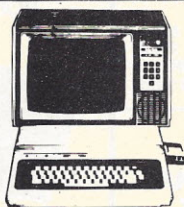
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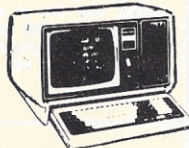
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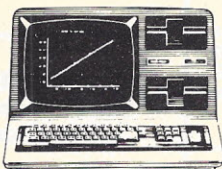
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CIRCLE INQUIRY NO. 317

**Small business software** is available for the Atari 800. Microledger performs trial balances, produces profit and loss statements and balance sheets, as well as outputting an audit trail. The features specific to it are options allowing the user to quickly and easily review and update any records in the journal or chart of accounts, a running balance column in the journal which shows the user on the input whether or not the journal is balanced, and numerous error traps alerting the user to improper inputs. Price: \$140. Compumax Inc., P.O. Box 1139, Palo Alto, CA 94301, (415) 321-2881.

CIRCLE INQUIRY NO. 318

**Financial software package** designed specifically for mortgage and finance companies performs all of the record keeping and servicing of trust deed loans as well as the maintaining of the investor records. Financier system produces: investor checks, trustor payment receipts, investor monthly and or quarterly reports, trust deed listings by maturity date, dunning letters (collection letters), check register, interest register, profit and loss statements, and balance sheet. The system is designed to run on CP/M or MP/M operating systems and is supplied in compiled form. All ABS software is hard-disk compatible and supports multi-user application. Applied Business Software, 15614 S. Hawthorne Blvd., Suite 104, Lawndale, CA 90260, (213) 679-0651.

CIRCLE INQUIRY NO. 319

**Client write-up system** designed for the certified public accountant integrates all write-up function into an easy to use automated system. This general ledger system includes: unique video journal entry program with automatic paging, on-line account verification, automatic journal balancing and control over nine separate journal books. Working reports that can be generated include a general ledger detail, working trial balance, general ledger summary and several other assorted control reports. Reports are available in 80 or 132 column presentation and/or may be viewed on the video screen with the systems extensive video inquiry capabilities. Headings, title columns, dollar signs, money columns, underlining, accumulations, and other presentation features are

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## EDUCATIONAL

**Class management package** includes systems for class roster development, teacher schedule preparation, student grade entry, report card preparation, master record development, and student file management. The newly packaged product offers an extended operating manual, a full featured system of programs for the school administrator, and a complete student counselling and guidance management system. The system offers the printing of class rosters, report cards, honor roll lists, master records, and file folder labels. Price: \$299.95. Charles Mann and Associates, 7594 San Remo Trail, Yucca Valley, CA 92284, (714) 365-9718.

CIRCLE INQUIRY NO. 321

**Educational game**, Galactic Guardian, presents the questions and answers in a space game format. The student is asked to save the galaxy from invading spacemen by correctly responding to the questions contained on the subject data tape. All corrected answers are reinforced and wrong answers corrected. Guillotine is a variation of the hangman game. This game transports the student to the French Revolution. His job is to save the man on the screen by correctly answering the questions presented to him/her. The games come on a single cassette with instructions. Teach Yourself by Computer Software, 40 Stuyvesant Manor, Geneseo, NY 14454, (716) 243-3005.

CIRCLE INQUIRY NO. 322

**Computer-aided instruction software** is used by colleges and secondary schools as a replacement for timeshare services or groups of small individual Radio Shack or Apple computers. The TI 32 system uses an extended Basic language similar to that used on the DEC-10. Programs include simulations in chemistry and biology, statistical programs for natural and social sciences, computer-assisted drill and instruction in biology, chemistry, English, political science and CPR principles. The programs are written in Basic to run on the Technico TI 32 which is available in floppy disk and hard disk models and can support up to fifteen simultaneous users who may operate the Technico computer in a local or remote mode. In addition, terminal switches can be installed, which allows continued access to an existing timeshare service. Technico, 9051 Red Branch Rd., Columbia, MD 21045, (301) 995-1995.

CIRCLE INQUIRY NO. 324

**Instructional system** is designed to help learners gain and use fundamental tools and concepts in beginning algebra. Each diskette which comprises the complete algebra



# The book you've been waiting for...

Ever since Radio Shack sold the first TRS-80 Model I users have been searching for detailed information about its inner workings that Tandy would not, or could not, make available. In particular the Level II BASIC from Microsoft contains dozens of subroutines that can be tremendously useful to any programmer, but Tandy Corporation is probably under contractual obligation to Microsoft not to supply information (if they even have it!).

Dedicated users, proficient in assembly language, have disassembled the Level II ROMs and made their own comments. But the majority of users are left in with virtually no information, apart from occasional articles and whatever they can decipher on their own.

**ENTERPRISING USERS** - Several of the more enterprising programmers realized that if they published their own comments a lot of TRS-80 users would buy them. The BOOK, Disassembled Handbook and Supermap are some of the available books giving comments on the ROM set - but they all suffer from serious drawbacks, being either incomplete, unintelligible or even worse - inaccurate!

Incomplete books are usually published when the author has not finished understanding what he's writing about. Hence the "continued next book" lines in some publications, translated into english read "buy another book when I've done some more work". Unintelligible books are due to poor editing, or no editing at all! Inaccurate information is a result of not checking with anyone else.

Microsoft BASIC Decoded & Other Mysteries is both complete and understandable. Nearly 7,000 lines of comments for the Level II ROMs, with an additional 6 chapters of useful information, make this the biggest and best book available on the subject.

Written by James Favour, the comment section took more than a

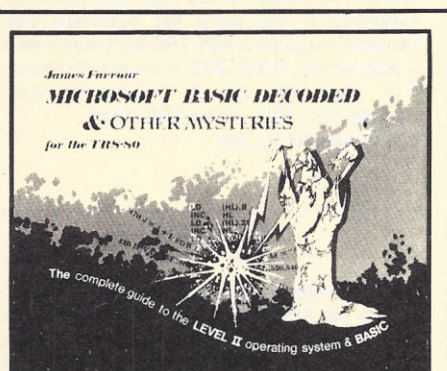
year to finish - it even includes the changes for the latest ROM set in an appendix. Edited by Jim Perry, until recently managing editor of 80 Microcomputing, the text and comments are understandable.

Tested examples are given for virtually every ROM subroutine, showing you how to CALL them from BASIC or use them in an assembly language program. With more than 300 pages Microsoft BASIC Decoded & Other Mysteries is by far the largest book about Level II available.

Copyright - In order to respect Microsoft copyright the actual disassembled code is not printed, but the book is designed to come apart and fit into a standard 3 ring binder with your own disassembly (all pages are pre-drilled).

In short, Microsoft BASIC Decoded & Other Mysteries, is the most complete, understandable and accurate guide to your Level II ROMs that is available - bar none!

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Complete & Understandable - IJG, publishers of TRS-80 Disk & Other Mysteries, could have published an incomplete or unintelligible book on the ROMs - but chose to wait and do it properly.

## FOR TRS-80 USERS

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CIRCLE INQUIRY NO. 92

system stands completely independent of the others. As skills are fully mastered in one, additional units may be purchased. Algebra features total color high-resolution graphics display; upper/lower case text for maximum clarity; and flow charted "information maps" which mark the learner's progress. Comprehensive documentation describes the system and its instructional prototype. 3.3 DOS and 48K Applesoft are required. Price: \$39.95. Edu-Ware Services, Inc., 22222 Sherman Way, Suite 102, Canoga Park, CA 91303.

CIRCLE INQUIRY NO. 325

**Spelling checker**, Hexspell, is compatible with most of the word processing programs available for the TRS-80, including Radio Shack's Scripsit. It reads through documents, checking the words against its 29,000 word wordlist while simultaneously displaying the text for a manual proofread. The program features simple fast error correction. Erroneous words are shown in full context when detected, and can be immediately replaced. The replacement word is itself instantly rechecked to ensure correctness. Hexspell rapidly adapts itself to the user's vocabulary—it can be taught to become bilingual. A single keystroke teaches a new word, and the program constantly optimizes its wordlist so that frequently used words are found fastest. Unused words are automatically forgotten if the word list becomes full. Hexspell requires a 48K TRS-80 model I with 2 disk drives. Price: \$69. Hexagon Systems, P.O. Box 397, Stn A, Vancouver, B.C. Canada V6C 2N2, (604) 682-7646.

CIRCLE INQUIRY NO. 326

## GAMES

**Fantasy role-playing game**, Hellfire Warrior, allows the player to take on the role of his favorite hero. The player must rescue the warrior maid from the depths of a four-level dungeon and bring her back to sun and air. The game has more than 200 rooms—riddled with trap doors, bottomless pits, and filled with monsters and treasures, and the player must kill the great bat-winged demon, cross bridges of flame, face death itself and live before the adventure is complete. For experienced fantasy role-playing gamers, the game is available on cassette for the Pet (32K) and TRS-80 (level II, 16K), and on disk for the TRS-80 (32K) and the Apple (48K with ROM Applesoft) for \$39.95. Automated Simulations, P.O. Box 4247, Mountain View, CA 94040.

CIRCLE INQUIRY NO. 327

**Wargame**, Computer Conflict, consists of two introductory games, Rebel Force and Red Attack! Rebel Force allows you to command a Soviet regiment which must retake a vital town overrun by a computer-directed guerrilla uprising. Using armored, infantry, and heavy weapons companies, you must negotiate the hi-res mapboard while being opposed by minefields, ambushes, militia, and anti-tank guns—all skillfully deployed by your computer in one of 5 levels of complexity. Red Attack! is a two player game that simulates an invasion by a mixed Soviet tank and infantry force against a defending battalion. The victor goes to the player commanding 2 of the 3 vital crossroads at the end of the game. The game is available

for a 48K Apple II (Applesoft ROM) on disc. Price: \$39.95. Strategic Simulations Inc., 465 Fairchild Dr., Suite 108, Mountain View, CA 94043, (415) 964-1353.

CIRCLE INQUIRY NO. 328

**Football game**, Tuesday Morning Quarterback, gives you 30 seconds to choose from 16 different offensive plays with eight pass patterns, seven running plays, plus an option, and six defensive patterns—nearly 100 offense/defense combinations. The game is for beginners and experts alike. It comes with two additional programs. One lets you make substitutions, transfer players, keep up with injuries and even draft new choices. You can easily create your own all-star team and update your team rosters. Another program lets you practice your kicking skills before you start huddling for the real action. You do not have to be a football expert to play. A glossary of football terms and some helpful hints to improve your strategies are included to help you with your decision making. The game is available on disk for the Apple with 48K and Applesoft in ROM. Price: \$29.95. Automated Simulations, P.O. Box 4247, Mountain View, CA 94040.

CIRCLE INQUIRY NO. 329

**Wargame**, Missile Command, begins with wave after wave of enemy missiles raining down on an earth missile base and 6 surrounding cities. The player, as base commander, is responsible for protecting and defending the territory from enemy attack. To combat each wave of enemy missiles, the base commander is given 30 guided defense missiles which, when exploded in the path of attacking missiles, destroys them. Each successive wave of attacking missiles comes faster than the previous one and the game continues until all cities and the missile base are lost. After the sixth wave of missiles, the enemy may attack with smart cruise missiles. Shaped like satellites, they can detect and evade defense missile explosions. Unless the player can place the defense missile target directly on the smart enemy missile, the enemy will be successful in getting through to one of the cities or the missile base. Dumb enemy cruise missiles are easier to stop as they can't detect defense movements and travel in a straight line. In addition to enemy missiles destroyed, points are scored for unused defense missiles and saved cities. A bonus city is given for every 10,000 points scored. Additional features include game difficulty adjustment to correspond to player skill levels, slow game variations designed for young children and screen color changes as game progresses to reduce eyestrain during extended game play. Price: \$31.95. Atari Inc., 1265 Borregas Ave., P.O. Box 427, Sunnyvale, CA 94086.

CIRCLE INQUIRY NO. 330

**Chess and Checkers** programs, MicroChess and Checker King, are for the Atari 400 and 800 computers. MicroChess turns a computer display screen into a chess board. Checker King turns the computer display screen into a colorful checkerboard. Both programs are illustrated using high-resolution graphics. Personal Software, 1330 Bordeaux Dr., Sunnyvale, CA 94086, (408) 745-7841.

CIRCLE INQUIRY NO. 332

**Casino blackjack table** is simulated on the TRS-80 screen by the Casino Blackjack/



Counter program. The player plays the center hand of five, and watches all the cards as they fall on each one. Standard casino rules are observed—the player may split, double down, take insurance bets, and the dealer must hit 16 and stand on 17. One deck may be used, or two or four decks mixed together. For counting practice or casual play, three dealing speeds can be selected. For TRS-80 models I and III. Cassette \$14.95, disk \$19.95. Manhattan Software, P.O. Box 35, Pacific Palisades, CA 90272, (213) 454-8290.

**CIRCLE INQUIRY NO. 333**

**Intelligent chess program** is designed for the model I TRS-80 tape system and disk system. This computer chess master features a choice of ten levels of play from blitz where the computer has three seconds to move to infinity where the computer considers every conceivable play. The program is a conservative player and follows all the accepted rules of international play. Another feature of Chessmate 80 is its ability to move for you. It excels as a chess teacher in that the user can observe the computer actually selecting through alternative moves as it executes its decision making process. Instant Software Inc., Peterborough, NH 03458.

**CIRCLE INQUIRY NO. 334**

**War game.** The Warp Factor, allows one or two players to choose from among 12 starship designs representing 5 Galactic Empires. The players are placed squarely in the Captain's role, dealing with the critical parameters of interstellar battle such as energy allocation for phasers, shields, disruptor bolts, screens, and warp engines. With an average game lasting between thirty minutes and four hours, the players can create scenarios ranging from space skirmishes to a full-scale, all-out war. Price: \$39.95. Strategic Simulations Inc., 465 Fairchild Dr., Suite 108, Mountain View, CA 94043, (415) 964-1353.

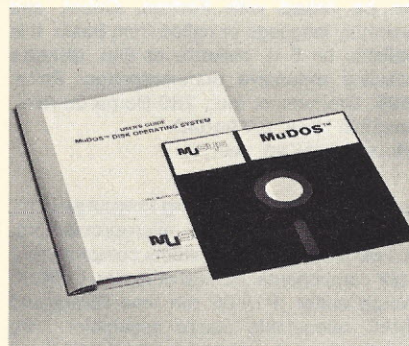
**CIRCLE INQUIRY NO. 335**

## SYSTEMS

**Operating system.** Oasis version 5.5 Multi-user Spooler, is designed for Z80 microcomputers. With up to 15 users accessing a single printer, the system allows maximum printing efficiency. Twenty-six user-defined queues can be used to prioritize waiting jobs or execute special forms. Archive and Restore, a back-up utility, can be used to protect large amounts of hard disk data on tape cartridge or multiple floppies. Designed for files that are often updated but rarely accessed sequentially, keyed file capabilities compliment the system's existing direct, sequential and ISAM files. Other features include flexibility in maintaining public, private or shared files with versatile security and accounting controls; file locking and automatic record locking; convenient inter-user communications; and a general purpose text editor. Price: \$500 for single-user and \$850 for multi-user versions. Phase One Systems, 7700 Edgewater Dr., Suite 830 Oakland, CA 94621, (415) 562-8085.

**CIRCLE INQUIRY NO. 336**

**CP/M compatible operating system** offers higher throughput, increased reliability and extra professional features for both single and multiple-user environments. MuDOS is ideal for use with the MuSYS Net/80 and EXP/80 network slave processors. The system may be customized to any Z80-based hardware configuration and used in place of CP/M, MP/M and CP/Net. Program loading under the system is six times faster than CP/M. File processing functions average three to five times faster. It uses the extra registers and instructions available on the Z80 to speed processing of operating system calls. The



system is an ideal replacement for CP/NET in the MuSYS Net/80 network slave processor. Net/80 performs as a Z80 slave loosely coupled to an S-100 bus and includes 64K of RAM, a single level interrupt, a console serial port and a parallel port for communication with the S-100 bus master CPU. The MuSYS EXP/80 expansion board adds a second serial port, a Centronics-compatible printer or 8-bit bidirectional parallel port, priority interrupt control, real time clock and other features to such networks. Price: \$300-\$750. MuSYS Corp., 1451 E. Irvine Blvd., Suite 11, Tustin, CA 92680, (714) 730-5692.

**CIRCLE INQUIRY NO. 337**

**CP/M version** of North Star 2.2 allows users of the Horizon microcomputer to have a fully compatible operating system for both floppy and hard disk systems. The unit consists of a single diskette that works with a double density, quad capacity and hard disk systems, and features a unique sequential file access capability. Approximate price: \$230. North Star Computers, Inc., 1440 Fourth St., Berkeley, CA 94710, (415) 527-6950.

**CIRCLE INQUIRY NO. 338**

**Operating system** and programming language designed to speed software development of high-performance applications for the Motorola Exorset 30 microcomputer, is a fully interactive development tool, used for instrumentation, process control, data acquisition, graphics, and similar projects. Polyforth includes a screen editor, in addition to the standard Polyforth multi-programmed operating system, assembler, interpreters, and Forth language compiler. A special CAI course for novice Forth programmers is included on a separate diskette. Options include 2-D graphics, a math package based on fixed-point fraction arithmetic, and file management. Price: \$4,750. Forth, Inc., 2309 Pacific Coast Hwy., Hermosa Beach, CA 90254, (213) 372-8493.

**CIRCLE INQUIRY NO. 339**

**Project control system** for large or small project teams provides weekly status reporting by team member and for the entire project. The software can operate with the CP/M operating system. Project Monitoring System's weekly reports are based on an original schedule and a revised estimate-to-complete. Schedules are developed for each project team member consistent with the overall time-frame and estimated effort. The system generates a Project Schedule Summary, listing each activity and the weekly estimates by individual. This schedule is finalized by the team managers and provides the basis for future monitoring. Documentation for the Project Monitoring System includes a description of each screen and report. One chapter discusses the steps necessary to set up a project. The installation section includes sufficient Fortran code to be compatible with most systems. Only four routines must be updated for the host computer. The software requires a Fortran compiler and the source code is included with the purchase. Price: \$175. Escape, Ltd., P.O. Box 18797, Atlanta, GA 30326, (404) 255-0404.

**CIRCLE INQUIRY NO. 341**

**Oasis operating system** is now available for new NNC Electronics System 80/80W microcomputers. The combination allows unique flexibility in maintaining public, private or shared files with versatile multi-user security and accounting controls. File locking and automatic record locking insure data integrity for up to 4 users on the 128K RAM systems. Supporting the NNC system 80W 10M-byte Winchester hard disk, Oasis compliments the mass storage media with sophisticated archive and restore back-up capabilities. Multi-user Spooler, convenient inter-user communications capabilities, and general purpose text editor are additional software features. Prices: \$500 for single-user and \$850 for multi-user versions. Phase One Systems, 7700 Edgewater Dr., Suite 830, Oakland, CA 94621, (415) 562-8085.

**CIRCLE INQUIRY NO. 356**

**System support** for North Star Horizon with hard disk can be increased up to five terminals with the addition of TSS/A. It is a multi-user operating system, supporting North Star's integrated application software systems, providing users with shared access to the system programs. It gives the computer important flexibility for expanding with the increasing demands of the end-user. This capacity is especially important to small business customers who need to plan for orderly expansion in data and word processing stride-for-stride with their growing enterprises. All present Horizons can be expanded up to a five-user system with the addition of a hard disk, memory, and multi-port I/O supported by the TSS/A software package. North Star Computers, 14440 Catalina St., San Leandro, CA 94577, (415) 357-8500.

**CIRCLE INQUIRY NO. 355**

**Programming language.** C, is for use on Cromemco's Z80A-based, S-100 microcomputer systems. The powerful, general purpose programming language features economy of expression, modern control flow and data structures, and a rich set of operators. C, which was originally developed



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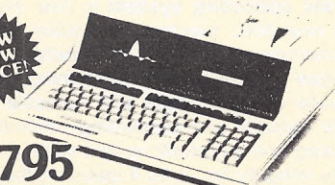
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and implemented on the Unix operating system, is an effective programming language for a wide range of applications. C combines features and powers provided by assembly languages with the structured programming techniques available in higher level languages. It is extremely effective for writing operating systems, languages, utilities and I/O drivers, communication software, database management systems, file management software, and fast graphics software. The C programming language operates under the multi-user, multi-tasking Cromix operating system and produces relocatable code that can be linked with Fortran, Cobol, and Assembly language or called from Basic. It is available on 5-in. diskette or 8-in. diskette including extensive documentation. Price: \$595. Cromemco, Inc., 280 Bernardo Ave., Mountain View, CA 94043.

CIRCLE INQUIRY NO. 340

**Application programming language** is for 8080, Z80 and 8085 microprocessors. PL/I-80 programming systems comprise four major components: PL/I-80 compiler, LINK-80 linkage editor, P1/I-80 run time library and RMAC relocatable macro assembler. The system generates industry standard Micro-soft relocatable code so users can link load subroutines created by other language translators. LINK-80, a disk to disk link loader, can load programs up to the maximum size of the machine. The run time library contains over 300 individual subroutines but loads only those which are used by your program. An executable program can be as small as 600 bytes. The package includes three manuals and a programmer's quick reference guide. The large number of sample programs provided serve as a thorough hands on course in PL/I programming. Price: \$500, documentation \$35. Westico, Inc., 25 Zant St., Norwalk, CT 06855, (203) 853-6880.

CIRCLE INQUIRY NO. 342

**System software product**, Formula/1, is aimed at the telecommunication users desiring an across the board improvement in transaction response time. The product yields a performance response boost and requires absolutely no changes to either the telecommunications monitor or user application programs. Performance improvements of 20% to 60% are possible in individual transaction response times, as well as in CICs and IDMS-DC start-up. Gains will vary depending on the complexity and the volume of the environment. Because the product decreases system overhead, even well tuned applications will experience performance improvement. It functions in all OS/VS environments on a full range of IBM mainframes and compatible processors. Price: \$5,500. DBMS, Inc., 33 W. Roosevelt Rd., Lombard, IL 60148, (312) 325-6600.

CIRCLE INQUIRY NO. 343

**Oasis operating system** is available for the S-100 based California Computer Systems CCS 200, CCS 300 and CCS 400 microcomputers. The Oasis/CCS combination allows flexibility in maintaining public, private or shared files with versatile user security and accounting controls. File locking and automatic record locking insure data integrity for up to 16 users on the easily expanded microcomputer. Archive and Restore, it's sophisticated back-up utilities, support the California Computer System's 10- and

20-Mbyte Winchester-type hard disk. Multi-user Spooler, convenient inter-user communication capabilities, and general purpose text editor are additional software features. Comprehensive program development support includes high level Basic with re-entrant run-time module, EXEC interactive job control language, text editors, compiler, interpreter, relocating macro assembler, debugger, linkage editor, and diagnostic/conversion programs. File Sort and RM Cobol are optionally available. Price: \$500 for single-user and \$850 for multi-user versions. Phase One Systems, Inc., 7700 Edgewater Dr., Suite 830, Oakland, CA 94621, (415) 562-8085.

CIRCLE INQUIRY NO. 345

**Firmware and software set** enhances the CP/M operating system on the Intertec SuperBrain. With the package installed, disk capacity is increased 16%, and the track-to-track step rate is five times faster. The spindle motor can be shut off when the disks are not being accessed. Features include the capability to program 35 keys, buffered I/O on either RS232 port, special keycap support for popular word processing programs, spindle motor speed check, programmable handshaking modes, and a real time clock. Continued are the lobyte capability, keyboard type ahead, auto repeat on all keys, greater screen control, an optional diagnostic package, and a full manual with interface, operation, and maintenance information on SuperBrains. SB/E is available for both standard and quad density SuperBrains, for DOS versions 3.0 or later. Price: \$195. IE Systems Inc., 98 Main St., Newmarket, NH 03857, (603) 659-5891.

CIRCLE INQUIRY NO. 346

## UTILITY

**Language modification**, Alpha-Cobol level 3.3, contains a number of added features. It is among the most complete level 2 implementation although still running in a user partition of 32K bytes. It provides a complete symbolic debugger with features and facilities never before available on a micro based product. Angusglow Ltd., 20 St. Albans Grove, London W.8. England, phone 01-486 0702.

CIRCLE INQUIRY NO. 347

**Source code translator** translates Zilog Z-80 assembly language source code to Z-8000 source code. Output will assemble on the 2500 A.D. cross assembler. The program provides a "worksheet" printout showing: original Zilog Z-80 source code statement and comments; resulting Z-8000 source code; flags any added lines; flags with warning messages any statement that needs modification before running (as a precaution these warning messages become part of the Z-8000 source code until removed); shows total number of source code lines, added lines, warning messages and fatal errors (improper Z-80 code) detected. Required hardware includes: 48K RAM minimum; Z-80 microprocessor; minimum 1 8-in. floppy disk drive—single density. Required software includes: CP/M 2.0 operating system; 2500 A.D. cross assembler or assembler for object code generation. 2500 A.D., P.O. Box 441410, Aurora, CO 80014.

CIRCLE INQUIRY NO. 348



**Programmers' utility**, the Fortranslator, is for use on the TRS-80 models II and III, as well as an enhanced version of the model I program. The software is meant to aid in the transfer of disk Basic programs to the Fortran packages available for the models. While total translation is not possible, these programs will save a lot of routine typing and clerical work in program transfer. The resulting Fortran style program puts the translated Basic program into a 'template' with most of the unique Fortran READ/WRITE/FORMAT, the sub-routine CALLS and GOTO forms are followed as is the general indentation and arrangement of the program. After translation, the program may be finished on the editor package of Fortran and then compiled. Fortranslator will do between 60 and 85% of the conversion work depending upon the program content. Prices: model I, \$29.95; model II, \$34.95; model III, \$29.95 All are supplied on disk, postpaid. The Management, Box T, Aledo, TX 76008.

**CIRCLE INQUIRY NO. 350**

**Software packages** transform the CBM Pet microcomputer into an ASCII RS232 terminal. This series of software permits bi-directional communication to any RS232 device such as a modem. The software can directly drive any RS232 device that uses TTL levels. A hardware interface is available that allows the connection of devices requiring RS232C levels. The software is available in two forms. The first version, TE300, operates as a standard ASCII terminal. The second version, TE300-FTC, provides two-way file transfers using the CBM 2040/8050 floppy disk drives. Files stored on diskette can be sent directly down-line to a mainframe via the TE300-FTC, or mainframe files can be saved directly onto

floppy diskette(s). Data transfer for the TE300 series of terminal emulators is at a rate of 50 to 600 baud bi-directional. It is also possible to run at split speeds thus allowing a maximum output rate of 2400



baud. The TE300 software packages include documentation, software stored on floppy diskette and on a backup diskette, and a connector cable. Price: from \$150. Ph.D. Associates, 107 Fordwich Cres., Rexdale, Ontario, M9W 2T6, Canada.

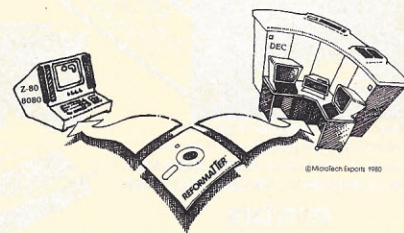
**CIRCLE INQUIRY NO. 349**

**Animation program**, Rainbow Writer, includes graphics, text and music development aids. It runs on the Apple II and Apple II Plus personal computers. The program can be used to create special effects featuring color, animation, letters, shapes and sounds. Because of the simple commands and menu-type selections that require little prior training to use, special effects can be achieved with far less effort than would be required when programming from scratch. Price: \$40. Personal Software, 1330 Bordeaux Dr.,

Sunnyvale, CA 94086, (408) 745-7841.

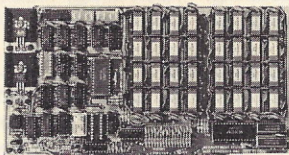
**CIRCLE INQUIRY NO. 351**

**Conversion software**, Reformatter, allows CP/M users to exchange data files with DEC computers using floppy disk as transfer medium. It runs under the CP/M operating system and reads and writes floppy disks in the DEC RT-11 format. Users have the ability to transfer data files bidirectionally, and alter any of the fields in the DEC RT-11 directory such as "file create date" and "file protect status". It also lists the DEC directory, and displays the unused areas of the disk. A



squeeze function is available, which allows a fragmented DEC diskette to be packed into a continuous data area. The DEC RT-11 format is the most basic diskette format available on DEC equipment. Most of the low-end PDP/11s and LSI/11s use the RT-11 operating system. The more complex operating systems, like RSX11 and RSTS, also support the RT-11 file format thru the use of diskette utilities within those operating systems. Price: \$195. MicroTech Exports, 467 Hamilton Ave., Palo Alto, CA 94301, (415) 324-9114.

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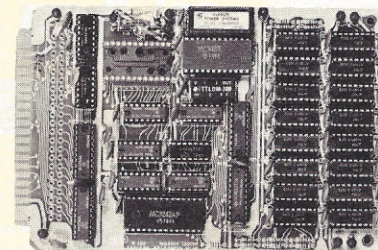
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**Jul 2-4 Science and Technology Exhibit**, Adam's Mark Hotel, Houston, TX, exhibits by industrial, educational and research organizations concerned with energy advancements through technology. Tony Hill, CET, Houston Engineering and Scientific Society, 2615 Fannin St., Houston, TX 77002.

**Jul 5-31 Computer Camp on the Hill**, Hill School, Pottstown, PA, four one-week computer workshops run by John E. Parnell. Open to youngsters in grades 7 through 12, the classes will feature maximum hands-on exposure. John E. Parnell, Hill School, Pottstown, PA 19464.

**Jul 5-Aug 28 Computer Camp**, Zaca Lake, Santa Barbara, CA, four two-week sessions combining outdoor learning environment with studies of computer science. Open to youngsters 10-18. Computer Camp Inc., 1235 Coast Village Rd., Suite G, Santa Barbara, CA 93108, (805) 965-7777.

**Jul 19-24 National Computer Camp**, Grand View Lodge, Moodus, CT, recreational and educational weekend for youngsters with emphasis on computer technology. Additional session held July 26-31. Computer Camp, Grand View Lodge, Box 22, Moodus, CT 06469.

**Jul 26-31 Harvard Computer Graphics Week '81**, Harvard University, Cambridge, MA, seminars spanning all aspects of management graphics and developments in computer mapping. Laboratory for Computer Graphics, Harvard U., 48 Quincy St., Cambridge, MA 02138.

**Jul 29-31 1981 Microcomputer Show**, Wembley Conference Centre, London, England, seminars and exhibitions covering various aspects of the use of microprocessors in business and manufacturing. Technology Marketing and Analysis Corp., 680 Beach St., San Francisco, CA 94109.

**Aug 10-14 Reliability and Life Testing**, UCLA campus, Los Angeles, CA, short course for engineers and scientists involved with the reliability, design, product assurance, quality and safety aspects of components, equipment and systems. Short Course Program Office, 6266 Boelter Hall, UCLA Extension, Los Angeles, CA 90024, (213) 825-1047.

**Aug 10-14 Seminars for the Systems Analyst**, Grand Portage Lodge and Convention Center, Grand Portage, MN, comprehensive courses covering technology and interpersonal management skills. Pam Jensen, Executive Development Center, 324 Business Administration, 271 19th Ave. S., University of Minnesota, Minneapolis, MN 55455.

**Aug 18-20 International Symposium on Electromagnetic Compatibility**, U. of Colorado, Boulder, CO, providing information on how to measure and ameliorate problems of unwanted electromagnetic radiation in manufacturing electronic products. Charlotte Tyson, EMC '81, IBM, P.O. Box 1900, Boulder, CO 80302, (303) 447-5072.

**Aug 26-29 National Small Computer Show**, New York Coliseum, New York, NY, lectures, seminars, and exhibitions of microcomputer equipment. NSCS, 110 Charlotte Pl., Englewood Cliffs, NJ 07632, (201) 569-8542.

**Aug 28-30 Personal Computer Arts Festival**, Philadelphia Convention Center, Philadelphia, PA, discussions and displays of computer usage in the arts, including music synthesis, composition tools, digital sound synthesis, signal processing, video, film, sculpture. PCAF-81, Box 1954, Philadelphia, PA 19105.



**Sep 10-12 Personal Computer World Show**, Cunard Hotel, Hammersmith, London, England, demonstrations and discussions on wide variety of small computer systems. Timothy Collins, Personal Computer World Show, 11 Manchester Sq., London W1E 2QZ, England.

**Sep 14-17 Software Info '81**, Merchandise Mart Expo-center, Chicago, IL, talks and demonstrations on increasing productivity through packaged software. Software Info, 1730 N. Lynn St., Suite 400, Arlington, VA 22209, (703) 521-6209.

**Sep 15-17 Wescon '81**, Brooks Hall and Municipal Auditorium and Hilton Hotel, San Francisco, CA, conferences and demonstrations on aerospace avionics, data communications, components and devices, consumer electronics, energy, medical electronics, and office automation. Electronic Conventions, Inc., Suite 410, 999 N. Sepulveda Blvd., El Segundo, CA 90245, (213) 772-2965.

**Sep 15-24 Machine Tool Fair**, Hanover Fairgrounds, Hanover, Germany, more than 1,700 exhibitors from 80 different countries presenting new developments in machine tools and general metalworking technologies. Hanover Fair Informations Center, Box 338, Whitehouse, NJ 08888, (800) 526-5978.

**Sep 16-18 Integrated Management Systems Seminar**, Holiday Inn at O'Hare Airport, Schiller Park, IL, course on improving management skills, tailored to the needs of the

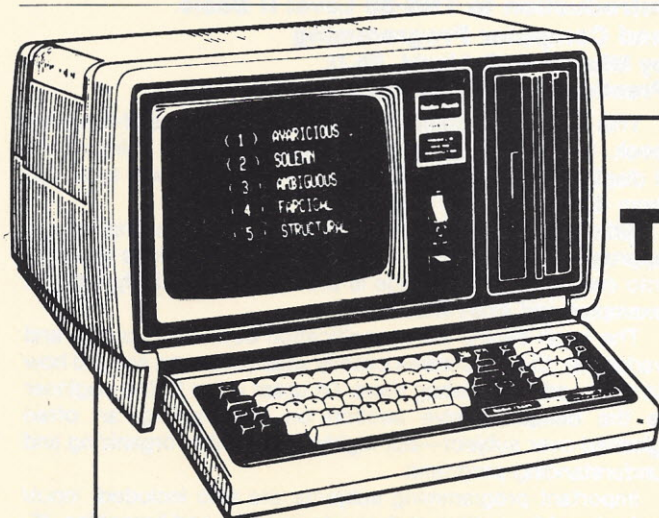
electronics industry. EIA Education, Suite 405, 2001 Eye St. N.W., Washington, D.C. 20006.

**Sep 21-23 Structured Information Systems Seminar**, series of two-and-a-half day seminars designed for DP/MIS management; focusing on a structured approach to information systems planning. Susan Shaw, InfoCom, MRB Box 125-17, Bangor, ME 04401, (207) 947-6886.

**Sep 21-25 Convention Informatique 1981**, Palais des Congres, Paris, France, discussions on office automation and telematics, legal, economic and social aspects of computerization. Secretariat de la Convention Informatique 4, Place de Valios, 75001 Paris, France, telephone (01) 261.52.42.

**Sep 21-25 International Switching Symposium**, Hotel Bonaventure, Montreal, Canada, discussions on telecommunications switching, including representatives from around the world. International Switching Symposium, P.O. Box 56, Station "Ile des Soeurs", Verdun, Quebec, Canada H3E 1J8, (514) 761-5831.

**Oct 2-3 Classroom Applications of Computers**, Independence High School, Santa Clara, CA, conference including hands-on tutorial sessions for teachers with several different hardware types at several levels of sophistication; also workshops and industrial exhibits of hardware and software. Don McKell, Independence High School, 1776 Educational Park Dr., San Jose, CA 95133, (408) 288-7642.

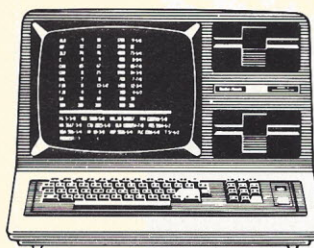


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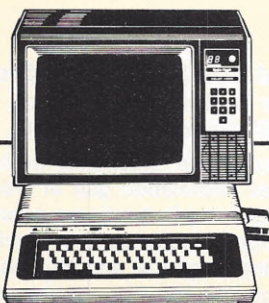
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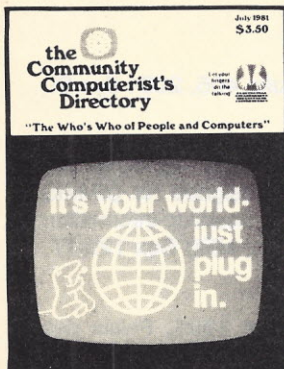
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CIRCLE INQUIRY NO. 112

# BOOK REVIEWS

**So You're Thinking About a Small Business Computer**  
 by Richard G. Canning and Nancy C. Leeper  
 Canning Publications, Vista, CA

Reviewed by Rocky Smolin

This is one of the better how-to books to be offered. Taking nothing for granted on the part of the reader, the first chapter is entitled 'How a Computer Can Help You.' The next chapter—'How Computers Work'—takes another large step in the demystification process. The book continues in a logical fashion, with a not-too-technical discussion of hardware—S-100, word processor, mini and microcomputers, etc. The next chapter on software is weak in terms of what you should expect from various applications, but gives good advice in locating and evaluating software.

Much of the rest of the book concerns a selection and implementation of a small business system including how to contract for custom programming and how to deal with consultants. Two extremely useful appendices are included—a glossary of common computer terms and a list of leading suppliers describing their hardware, what software support they offer, the price ranges, and their addresses.

Throughout the book there are pictures of 17 small business systems ranging in price from \$4,000 to \$30,000. The book's large type, 8½ by 11-in. format, and clear non-technical language make it a friendly, easy book for a first timer to read and learn the basics.

99 pages \$14

**Introduction to TRS-80 Level II Basic and Computer Programming**  
 by Michael P. Zabinski, Ph.D.  
 Prentice-Hall, Englewood Cliffs, NJ

This is a clear, comprehensible, essentially self-teaching book. Simply power up your computer to the point where it displays MEMORY SIZE? and Dr. Zabinski will take you from there.

Although the book follows the usual programming manual approach by presenting categories of instructions grouped into chapters, the language is presented effectively through examples and exercises.

The book begins with specification details (constants and variables), then describes exactly what programs are and how to write, edit and debug them. Of great value to the beginner is the comprehensive section on flowcharting, an often glossed over subject—but highly important in organizing and understanding programs.

Important programming subjects are also included: input/output and formatting statements, looping and branching, IF-THEN constructs, the library functions, subroutines, graphics and string handling.

This is certainly one of the best programming books available. It is highly recommended for first time TRS-80 users.

186 pages \$14.95

—RS

**Personal Computers Handbook**  
 by Walter H. Buchsbaum, Sc.D.  
 Howard W. Sams, Indianapolis, IN

This book, while excellently written and illustrated, misses the biggest information gap in the home computer market. The book is primarily hardware oriented, and written at a level requiring some background in electronics. It deals with logic gates, timing diagrams, and the construction and operation of charge coupled devices, bubble memories and other fas-



cinating, but esoteric, topics. Many who will understand these chapters are probably already familiar with the fundamentals of how computer hardware functions.

Most home computer owners are no more interested in the workings of the electronics than in how their TV works. What the home computer enthusiast needs to know is more about programs and programming—how to do it, where to buy it, ideas about useful or entertaining applications.

To this end, the first two chapters are enlightening. They discuss what computers really do, how to put your system to work, and various applications: educational, art, accounting, entertainment. There is an excellent chapter on principles of programming, and one on selected examples. Perhaps the most useful chapter is the one comparing the features of 15 systems, including approximate prices.

286 pages \$11.95

—RS

## People and Project Management

by Rob Thomsett

Yourdon Press, New York, NY

As the author points out, people, not project management systems, manage systems. Establishing and maintaining such a system so the flow of information can pass freely among the programmers, analysts, designers, and users is Thomsett's first objective. Secondly, he wishes to stress that project management must respond to the needs of the people working on the project in order to have job satisfaction and to achieve a common goal.

The first chapter reveals several recently developed systems laws that help the team members cope with the com-

plexity and uncertainty inherent in all complex systems. Subsequently, the concepts of control and information are defined showing how they should interrelate.

Another chapter examines new discoveries regarding an individual's job satisfaction, motivation, and performance, and the roles that management has in maximizing these issues.

Next, the author examines techniques for controlling systems development through structured methodologies. Such processes as work definition, planning, tracking and reporting are covered.

Finally, a set of guidelines for project management in the real world is presented, along with suggestions for implementing these strategies in your own situation.

Further progress in technology can only come with advances in the understanding of human interaction. This book takes a significant step in that direction.

120 pages \$10.50

—RS

## 33 Challenging Computer Games

for TRS-80/Apple/Pet

by David Chance

Tab Books, Blue Ridge Summit, PA

Reviewed by Dennis Doonan

Computers are becoming a major focus of home entertainment. Computer games are an alternative to television viewing for many families. The programs in this book can also be used to teach programming to those interested in Basic.

Of the 33 games, all but four can be used with either the TRS-80, Apple, or Pet. Four programs use TRS-80 graphics

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TI-59	295.00	199.95
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825 Printer/80 col Centronic 737	999.95	779.95
820 Printer/40 col Impact	450.00	359.95

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	Retail	Your Cost
Epson MX80 (with Graphics)	695.00	549.95
Epson MX70	450.00	399.95
RS-232		68.50
Paper Tiger 445G	894.00	695.00
Paper Tiger 460G	1394.00	1194.95
Paper Tiger 560G	1695.00	1399.95

Diablo 630/1 RO Advanced design 2695.00 2345.00

Centronics P1 Electrostatic 595.99 189.00

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Ontario Store: 902 Mountain (Ontario Plaza Shopping Center), Ontario, CA 91762

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## BOOK REVIEWS

as part of the game. In addition, the programs can be translated to most 8K versions of Basic with little difficulty. Two parts of the book will help with this translation. First is a chart comparing statements in three versions of Basic. A statement is listed for one version and its equivalent is listed for the other two. The appendix lists and explains statements peculiar to each Basic.

For each game, there is a general description, a sample run, a flow chart, and a source listing that can be entered and played. The games are divided into eight categories with several in each group. There are war games and adventures, self-improvement and educational games, calculation and speed games, and games using the computer's graphic capabilities.

Most of the games are designed for a single player to play against the computer. While none are overly sophisticated, they are challenging and interesting. Program design concepts can be learned by reading the easy to follow source listing and by studying the flow charts. With a little imagination, the reader will be able to customize the games to his own interests, or design his own.

The book provides a good buy for its entertainment and educational values.

256 pages \$7.95

## RECENT BOOKSHELF ADDITIONS

### TRS-80 Assembly Language

by Herbert S. Howe, Jr.

Prentice-Hall, Englewood Cliffs, NJ

\$9.95

### First Course in Data Processing in Basic

by J. Daniel Couger and Fred R. McFadden

John Wiley & Sons, Somerset, NJ

\$17.95

### Basic-Pack Statistics Programs for Small Computers

by Dennie Van Tassel

Prentice-Hall, Englewood Cliffs, NJ

\$16.95

### Using Structured Design

by Wayne P. Stevens

John Wiley & Sons, Somerset, NJ

\$24.95

### 1981 Software Writers Market

Kern Publications, Duxbury, MA

\$45

### Basically Speaking

### A Guide to Basic Programming for the Interact Computer

Micro Video, Ann Arbor, MI

\$14.95

### The 6502 Instruction Handbook

Scelbi Publications, Elmwood, CT

\$4.95

### Encyclopedia of Information Systems and Services Fourth Edition

edited by Anthony T. Kruzas and John Schmittroh, Jr.

Gale Research Co., Detroit, MI

\$175

### H-8 Programming for Beginners

by Ron Santore, Don Inman and Bob Albrecht

Dillithium Press, Beaverton, OR

\$8.95

### The PLL Synthesizer Cookbook

by Harold Kinley

Tab Books, Blue Ridge Summit, PA

\$13.95

### The Fortran Cookbook

by Thomas P. Dence

Tab Books, Blue Ridge Summit, PA

\$14.95

### Microcomputer Interfacing Handbook: A/D and D/A

by Joseph J. Carr

Tab Books, Blue Ridge Summit, PA

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## JUST CHECK SOME OF THESE FEATURES

- Supports six different relational search techniques.
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- Record length up to 800 characters.
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- Compatible 35, 40, 77 & 80 track drives.
- Has calculated equation fields.
- Complete report generator.
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SPECIAL INTRODUCTORY PRICE **\$79.95\***  
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**MAXI MANAGER for TRS-80 Models 1 & 3**  
Requires 48K of RAM and 1 Disk Drive Minimum.

**COMPATABLE WITH NEWDOS 2.1.**  
**NEWDOS 80 VERSION AVAILABLE FOR \$10**  
**AFTER INITIAL PURCHASE**

**MAXI MANAGER**  
**TRS-80 DISK MODEL 1 012-0096 \$79.95**

**MODEL 2 & 3 VERSIONS COMING SOON**

NOTE 1: File size is dependant on memory size.  
NOTE 2: Sequential files only.  
NOTE 3: User must apply own driver routine.  
NOTE 4: Hard copy print out only  
NOTE 5: Four functions (+ - \* /) only  
NOTE 6: Same as note #5 with a maximum of two calculated fields.  
NOTE 7: Available as a separate program for \$99.95.  
NOTE 8: 120 character maximum.  
NOTE 9: Data structures defined in manual.  
NOTE 10: 132 characters maximum.  
NOTE 11: User option (files can be read from ascending or descending order).

## DATA MANAGEMENT PROGRAM COMPARISON CHART

### FILE CAPACITY & FORMAT

	CCA DATA MANAGER	AIDS III with CALS	MAXI MANAGER	RADEX 10	PROFILE
Maximum # of disks per file	1	1	4	31	4
Maximum # of records per file	2450	Note 1	32,767	10,199	65,535
Maximum record length	249	254	800	255	255
Maximum # of characters per field	249	254	40	254	255
Maximum # of fields	24	20	20	127	153
Maximum # of characters per field label	15	10	19	12	765
Variable length records (pack sectors)	No	Note 2	Yes	No	No

### FIELD TYPES

Alphanumeric	Yes	Yes	Yes	Yes	Yes
Numeric	Yes	Yes	Yes	Yes	No
Fixed decimal numeric	Note 4	Yes	Yes	No	No
Date (MM/DD/YY)	Yes	No	Yes	No	No
Extended date (MM/DD/YYYY)	No	No	Yes	No	No
Calculated equation	Note 5	Note 6	Yes	No	No
Permanent fields	Yes	No	No	No	No

### SORTING

Machine language assisted	No	Yes	Yes	Note 7	Yes
Sort by any field	Yes	Yes	Yes		Yes
Number of Sort Key files	1	1	5		1
Numeric sort	Yes	Yes	Yes		No
Ascending sort	Yes	Yes	Yes		Yes
Descending sort	Yes	Yes	Note 11		Yes
Sort within a selected range	No	No	Yes		No
Sort multiple fields simultaneously	Yes	Yes	No		No

### FILE MAINTENANCE

Fixed length input fields	Yes	Yes	Yes	Yes	Yes
Single key entry of common data	No	No	Yes	No	No
Single field EDIT selection	Yes	Yes	Yes	Yes	Yes
Skip record (next or previous)	Yes	Yes	Yes	No	Yes
Search & EDIT record	No	Yes	Yes	No	Yes
Search & DELETE record	No	Yes	Yes	No	No
Auto rejection of alphanumeric data in numeric field	Yes	No	Yes	No	No

### RECORD SELECTION TECHNIQUES

Record number	Yes	Yes	Yes	Yes	No
Binary search (high speed)	No	No	Yes	No	No
Maximum # of simultaneous keys	1	4	10	31	1

### RELATIONAL COMPARISONS

Equal	No	Yes	Yes	Yes	Yes
Not equal	No	Yes	Yes	No	Yes
Greater than	No	Yes	Yes	Yes	Yes
Less than	No	Yes	Yes	Yes	Yes
Instring	Yes	No	Yes	Yes	No
AND / OR	No	No	Yes	Yes	No
Wild card masking	No	No	Yes	No	No

### PRINTING

User specified page title	Note 8	Yes	Yes	No	Note 10
User specified column headings	No	No	Yes	No	Yes
Automatic page numbering	Yes	Yes	Yes	Yes	Yes
Right justification	No	Yes	Yes	No	No
User defined column widths	Yes	No	Yes	Yes	Yes
User defined column separators	No	No	Yes	No	No
Keyboard entered columnar values	No	No	Yes	No	No
Merge data into form letters	No	No	Yes	No	No
Form filling applications	No	No	Yes	No	No
Columnar totals	Yes	Yes	Yes	No	No
Columnar subtotals generated upon change in a specific field	Yes	Yes	Yes	No	No
Built in screen print	No	No	Yes	No	No

### MISCELLANEOUS

Cost	\$75.00	\$94.90	\$99.95	\$99.00	\$79.95
Punctuation allowed within data fields	Yes	?	Yes	Yes	Yes
Upper / Lower case	Note 3	Note 3	Yes	Note 3	Note 3
Built in RS-232-C driver	Note 3	Note 3	Yes	Note 3	Note 3
Built-in TRS-232 driver	Note 3	Note 3	Yes	Note 3	Note 3
Programmer's interface	Note 9	Note 9	Yes	No	Note 9
Sample DATA disk	No	No	Yes	No	No
Documentation (# of pages)	?	?	93	38	29

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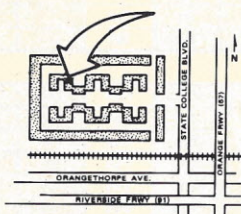
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CIRCLE INQUIRY NO. 114

# Free Literature

**Designer's guide** to TRW RF linear hybrid amplifiers is a full-size, 108-page handbook that describes in detail the construction and performance of 14 medium-power, broadband gain amplifiers designed for use in a variety of applications, including transmitter drivers, instrumentation and receivers. Each device is fully characterized through tables, graphs and engineering drawings. TRW RF Semiconductors, 14520 Aviation Blvd., Lawndale, CA 90260.

CIRCLE INQUIRY NO. 201

**Feeder drive system** for controlling exact lengths of strip metals fed into shears and presses used in metal-working industry is described in 6-page brochure. The publication describes how the drive system assures accurate cut lengths of material by accelerating, feeding, decelerating and holding strips to preset positions with precise timing during each cycle. Bulletin D-2637, Reliance Electric Co., 24703 Euclid Ave., Cleveland, OH 44117.

CIRCLE INQUIRY NO. 202

**Customer service brochure** describes the computer-to-computer remote diagnostic program of BTI Computer Systems. The concept of remotely diagnosing customer system problems via the telephone was pioneered by BTI. Service engineers, using local terminals, communicate with customer systems over standard telephone lines to execute remote diagnostics while troubleshooting system problems. BTI Computer Systems, 870 W. Maude Ave., Sunnyvale, CA 94086.

CIRCLE INQUIRY NO. 203

**Report catalog** describes reports on 52 categories of popular equipment and management methods. The reports contain informative narratives, comparison charts, prices, specifications and characteristics on currently available information processing products and services. User ratings are included in many reports. Datapro Research Corp., 1805 Underwood Blvd., Delran, NJ 08075.

CIRCLE INQUIRY NO. 204

**Switching power supply** handbook details the electrical and mechanical parameters on AC-DC and DC-DC power supplies. It is a complete presentation for the design engineer. Detailed specifications are presented in tabular form, including complete case, pin and socket configurations. Power General, 152 Will Dr., Canton, MA 02021.

CIRCLE INQUIRY NO. 205

**Process instrument** and service capabilities are detailed in application reference brochure. The publication describes Honeywell Corp.'s team approach in serving customer instrument and service needs, and highlights the company's application information, stand alone instruments, parts supplies and service capabilities. Honeywell/L.C.S., P.O. Box 5012, Clifton, NJ 07012.

CIRCLE INQUIRY NO. 206



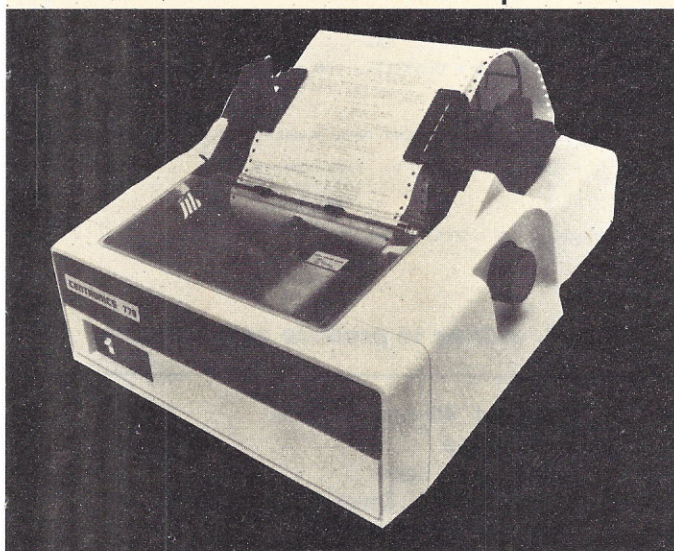
# Now save even more with factory rebates on Centronics<sup>®</sup> printers for the TRS-80<sup>®</sup>

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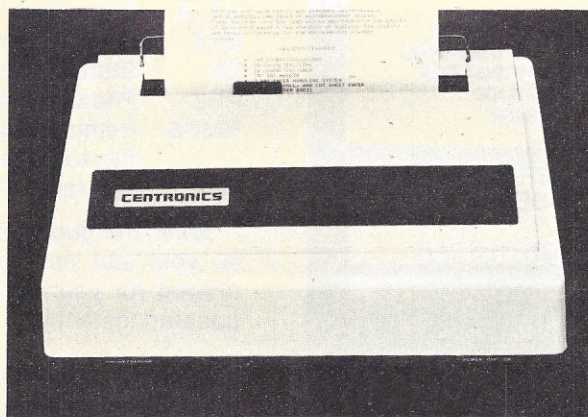
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less rebate of **100.**

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CIRCLE INQUIRY NO. 103

## Quick Register continued from page 74

QUICK REGISTER 12-11-1980

S = SALES RECEIPT

R = REVIEW TODAY'S SALES

END = END OF RUN

SELECT ACTION FROM TABLE ABOVE \_S\_

QUANTITY ? 0 = NO MORE ITEMS SOLD. \_1\_

PART NUMBER ? 1023000

QUANTITY ? 0 = NO MORE ITEMS SOLD. \_3\_

PART NUMBER ? 1053050

QUANTITY ? 0 = NO MORE ITEMS SOLD. 0

CHECK QUANTITY AND PART NUMBERS FOR SALES TICKET

ITEM #	QUANTITY	PART NUMBER
1	1	1023000
2	3	1053050

ANY CHANGES ? Y = YES, N = NO \_Y\_

CHANGE WHICH ITEM NUMBER ? \_2\_

INDICATE CHANGE. Q = QUANTITY, PN = PART NUMBER \_Q\_

NEW QUANTITY ? \_2\_

CHECK QUANTITY AND PART NUMBERS FOR SALES TICKET

ITEM #	QUANTITY	PART NUMBER
1	1	1023000
2	2	1053050

ANY CHANGES ? Y = YES, N = NO \_N\_

**Figure 4. Entries to produce sales invoice**

N Discount. 40 equals 40%  
 R Retail price  
 OH Quantity on hand  
 MN Minimum stock level  
 MX Maximum stock level  
 OO On order  
 S Quantity sold this month  
 YT Quantity sold year to date  
 P Part number in index. Increments of 50.  
 K Record number of the part P in the file PART.  
 SI Sales invoice number  
 NAM\$ Store name to appear on sales receipt  
 SR\$ Street address of store.  
 CTY\$ City where store is located.  
 ST\$ State where store is located.  
 Z\$ Store ZIP code.  
 PH\$ Phone number of store.  
 RMK\$ Remarks that will appear at the bottom of  
 the sales receipt.  
 TAX Tax rate for the store. .05 equals 5%.

Enter the quantities and part numbers for the items  
 as sold and not only will legible sales receipts be  
 printed for your customer, but your inventory will be  
 updated instantly.

Excerpted from the book Inventory Management for  
 Small Computers by Dilithium Press, Beaverton, OR. □

**Remaining figures and program follow**



UNTIL TODAY THERE WERE MORE THAN 20 DATA BASE MANAGERS FOR THE APPLE II.  
NOW THERE'S ONLY ONE!

# DB MASTER



## THE APPLE DATA BASE MANAGER YOU'VE BEEN WAITING FOR!

If you want an easy-to-use, flexible, and versatile data base manager, you have a choice of one. DB MASTER from Stoneware Microcomputer Products - soon to become the standard by which all others will be judged.

But don't just take our word for it. Compare the many advanced features of DB MASTER with the data base manager you're now using. Or for that matter, compare it with any data base manager on the market. No one will even come close.

FEATURES	DB MASTER	OTHER DBMS
<b>FILING SYSTEM:</b>		
Maximum search time to find any record by its primary key ....	UNDER 3 SECS	_____
True ISAM file system with multi-field primary keys .....	YES	_____
Multiple secondary keys for rapid access (5-7 seconds) to records by any field .....	YES	_____
Primary & Secondary keys maintained automatically—no need to rebuild keys after adding records .....	YES	_____
Maximum record size (bytes) .....	1020	_____
Maximum number of fields/record ..	100	_____
Handles files with more than one diskette of data .....	YES	_____
Custom disk operating system (DOS) for faster data retrieval and program chaining .....	YES	_____
User-designed screen formats .....	YES	_____
Up to 9 screen "pages" per record...	YES	_____
Ten field types, including dollar/cents, phone & social security number, date, etc. ....	YES	_____
Automatic data compaction for increased disk storage capacity.	YES	_____
Wild card, partial string, range and Boolean search capabilities...	YES	_____
Dynamic prompting (tm) - lists all available functions on screen—no need for quick reference card.	YES	_____
Password file protection .....	YES	_____
Four function calculator mode .....	YES	_____
Daily update lists for printout of all records added/edited on any day or range of dates .....	YES	_____

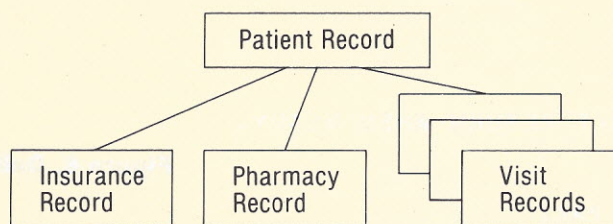
### REPORT GENERATOR:

Send reports to screen or printer ....	YES	_____
Sort on up to 6 fields at a time .....	YES	_____
Column subtotals and totals .....	YES	_____

Subtotal and page breaks .....	YES	_____
Up to 24 computed fields per report .	YES	_____
Up to 9 lines of column titles .....	YES	_____
Up to 9 lines for each record .....	YES	_____
Maximum number of fields per report	100	_____
Code fields - store short codes, print long descriptions .....	YES	_____
Comment lines and footnotes .....	YES	_____
Comment fields for printing labels or headers within each record ...	YES	_____
Summary only reports .....	YES	_____

Have a more complex application? DB MASTER can be used to emulate the hierarchical data base manager s used with larger computer systems!

### A typical Hierarchical File Structure:



(Learn more about emulating a hierarchical data base in our 140 page user's manual.)

### Coming soon:

DB MASTER UTILITY PAK #1: Add, drop or change fields in existing files without re-entering data!  
Interchange DB MASTER files with VisiCalc\* and other programs!

DB MASTER FOR HARD DISK SYSTEMS  
DB MASTER FOR THE APPLE III



CIRCLE INQUIRY NO. 115



DO YOU WANT A PRINTED COPY ? Y = YES, N = NO Y

SALES INVOICE # 11

12-11-1980

SAILING CENTER  
LAKEVIEW DRIVE BENBROOK, TEXAS 76126  
(888) 222-1234

ITEM #	QUANTITY	PART NUMBER	DESCRIPTION	PRICE	TOTAL
1	1	1023000	TRAVELER CAR	3.5	3.5
2	2	1053050	TILLER X HNG	5.5	11
				TOTAL	\$14.50
				TAX	.73
				TOTAL	\$15.23

SAILBOATS AND SUPPLIES

HIT RETURN WHEN READY.

**Figure 5. Entries to print the sales invoice**

SELECT ACTION FROM TABLE ABOVE R

DO YOU WANT A PRINTED COPY ? Y = YES, N = NO Y

DAILY SALES REPORT

12-11-1980

ITEM #	QUANTITY	PART NUMBER	DESCRIPTION	PRICE	TOTAL
2	2	1010000	GUDGEON	3.5	7
3	1	1053050	TILLER X HNG	5.5	5.5
4	3	1009200	DRAIN PLUG GASK	1.05	3.15
5	2	1050300	BALL 1 7/8	6.5	13
6	1	1026000	CLEAT JAM	1.65	1.65
7	5	1047050	CAM	3.98	19.9
8	2	1046050	RUDDER LOCK KIT	2.75	5.5
9	1	1023000	TRAVELER CAR	3.5	3.5
10	2	1053050	TILLER X HNG	5.5	11
11	1	1023000	TRAVELER CAR	3.5	3.5
12	2	1053050	TILLER X HNG	5.5	11
				TOTAL	\$84.70
				SALES TAX	\$4.24
				GRAND TOTAL	\$88.94

HIT RETURN WHEN READY.

**Figure 6. Daily sales report**

PART  
" !", " !", "- ", "RECORDS", 42, 0, -3, 0, 0, 0, 3, 3  
"1009200", "2305", "DRAIN PLUG GASK", "S", 40, 1.05, -2, 1, 1, 0, 13, 19  
"1010000", "2300", "GUDGEON", "F", 45, 3.5, -1, 2, 3, 0, 10, 16  
"1023000", "2152", "TRAVELER CAR", "S", 40, 3.5, -9, 1, 12, 0, 20, 26  
"102  
INDEX  
1009200, 2  
A>  
TICKET#  
13  
A>  
VENDOR  
"SAILING CENTER", "LAKEVIEW DRIVE", "BENBROOK", "TEXAS", "76126", "(888) 222-1234", "SAILBOATS AND SUPPLIES", .05  
A>

**Figure 7. Printout of files used**



## Program listing

QUICK1.BAS

```

REM QUICK REGISTER PROGRAM IN CBASIC.
REM COPYRIGHT 1980
REM CHUCK ATKINSON
REM RT 5 BOX 277-C FORT WORTH TEXAS 76126

PRINT CHR$(26) REM CLEAR THE SCREEN.

REM READ HEADING & TAX DATA FROM VENDOR FILE RECORD #1.

N$="VENDOR"
FILE N$(150)
N=1
IF END #1 THEN 780
READ #1,N;NAM$,SR$,CTY$,ST$,Z$,PH$,RMK$,TAX
CLOSE 1
GOTO 790

780 PRINT "VENDOR FILE NOT ON DISK. "
PRINT "NO REPORT HEADINGS OR TAX INFORMATION."

790 PRINT "ERASE THE DAILY FILE AT THE START OF EACH DAY."
PRINT
PRINT "DO YOU WANT TO ERASE THE DAILY SALES FILE ? "
INPUT "Y = YES, N = NO.";X$
IF X$="Y" THEN 795
GOTO 800

REM CREATE THE DAILY SALES FILE.
795 CREATE "DAILY" RECL 50 AS 3
W=1:Y$="DAILY SALES":A=0:W$="RECORDS":D=1
PRINT #3,D;Y$,W,A,W$
CLOSE 3
PRINT CHR$(26)

800 INPUT "TODAY'S DATE?";LINE DATES$

PRINT REM READ LAST INVOICE NUMBER FROM FILE.

S$="TICKET#"
FILE S$(15)
D=1
IF END #1 THEN 802

```

```

READ #1,D;SI
CLOSE 1
GOTO 805
802 CLOSE 1
SI=1

REM DISPLAY TABLE OF OPERATIONS.

805 PRINT CHR$(26)
PRINT
PRINT
REM PRINT SALES TICKETS AND POST TO FILE IN ONE STEP.
PRINT
PRINT TAB(27);"QUICK REGISTER";TAB(43);DATES
PRINT
PRINT TAB(27);"S = SALES RECEIPT"
PRINT
PRINT TAB(27);"R = REVIEW TODAY'S SALES"
PRINT
PRINT TAB(27);"END = END OF RUN"
PRINT
PRINT
INPUT "SELECT ACTION FROM TABLE ABOVE";A$
IF A$="S" THEN 808
IF A$="R" THEN 880
IF A$="END" THEN 895
GOTO 805

REM CREATE FILE TO HOLD THIS SALES RECEIPT NUMBER.

808 CREATE "POSTING" RECL 40 AS 4
SI=SI+1
Q=0:N=0:PN=0
810 PRINT CHR$(26)
N=N+1 REM ENTER ITEMS SOLD
INPUT "QUANTITY ?" Q = NO MORE ITEMS SOLD.";Q
IF Q=0 THEN 820
PRINT
PRINT
INPUT "PART NUMBER ?";P$
PRINT #4,N;P$,Q REM RECORD DATA IN POSTING FILE.
GOTO 810
820 N=0
PRINT CHR$(26)

REM DISPLAY DATA FOR OPERATOR
PRINT TAB(10);\
"CHECK QUANTITY AND PART NUMBERS FOR SALES TICKET"
PRINT
PRINT TAB(10);"ITEM #";TAB(20);"QUANTITY";TAB(30);\
"PART NUMBER"
830 N=N+1 REM DISPLAY ITEMS ON THIS SALE.
IF END #4 THEN 835

```



```

    READ #4,N;P$,Q
    PRINT TAB(10);N;TAB(20);Q;TAB(30);P$
    GOTO 830
835 PRINT
    INPUT "ANY CHANGES ? Y = YES, N = NO";A$
    IF A$="N" THEN 840 REM MAKE CORRECTIONS TO SALES LIST.
    N=0
    PRINT
    PRINT
    INPUT "CHANGE WHICH ITEM NUMBER ?";N
    IF END #4 THEN 840
    READ #4,N;P$,Q
    PRINT
    PRINT "ENTER CHANGE. "
    INPUT "Q = QUANTITY, PN = PART NUMBER";A$
    PRINT
    IF A$="Q" THEN INPUT "NEW QUANTITY ?";Q
    IF A$="PN" THEN INPUT "NEW PART NUMBER";PN
    PRINT #4,N;P$,Q
    GOTO 820

    REM POST QUANTITIES TO PARTS FILE AND READ LIST
    REM PRICE FOR SALES RECEIPT. ADD TO DAILY FILE.
840 GOSUB 900
    M=0:T=0:I=0
    PRINT "SALES INVOICE #";SI;TAB(57);DATE$
    PRINT TAB(20);NAM$
    PRINT TAB(10);SR$;" ";CTY$;" ";ST$;" ";Z$
    PRINT TAB(20);PH$
    PRINT
    PRINT "ITEM #";TAB(10);"QUANTITY";TAB(20);\
    "PART NUMBER";TAB(35);\
    "DESCRIPTION";TAB(55);"PRICE";TAB(65);"TOTAL"
845 M=M+1
    IF END #1 THEN 875
    READ #1,M;P$,Q REM READ FIRST ITEM ON THIS SALE.
    OPEN "B:PART" RECL 80 AS 2
    OPEN "DAILY" RECL 50 AS 3
    OPEN "B:INDEX" RECL 18 AS 4
    T=1
    IF END #4 THEN 850
847 READ #4,T;P,K REM LOCATE PART IN INDEX.
    IF P=PN THEN 850
    IF P>PN THEN 852
    T=T+1
    GOTO 847
850 I=K
    CLOSE 4 REM PART RECORD NUMBER LOCATED.
    GOTO 855
852 I=K-50
    CLOSE 4
855 IF END #2 THEN 875
    READ #2,I;P REM LOCATE P/N IN PARTS FILE.

```

```

    IF P=PN THEN 860
    IF P>PN THEN PRINT "PART NUMBER ";P;" NOT FOUND.";\
    CLOSE 3:\
    CLOSE 2:GOTO 845
    I=I+1
    GOTO 855
    REM READ PART NUMBER DATA.
860 READ #2,I;P$,L$,V$,D$,N,R,OH,MN,MX,OO,S,YT

    REM CALCULATE TOTALS AND SALES TAX.
    ST=Q*R:DT=DT+ST:TAXT=TAX*DT

    REM PRINT DATA FOR SALES RECEIPT.
    PRINT M;TAB(9);Q;TAB(20);P$;TAB(35);D$;TAB(54);\
    R;TAB(64);ST
    OH=OH-Q REM REDUCE QUANTITY ON HAND BY AMOUNT SOLD.
    S=S+Q REM ADD QUANTITY SOLD TO MONTH AND
    YT=YT+Q REM YEAR TOTALS.
865 PRINT #2,I;P$,L$,D$,V$,N,R,OH,MN,MX,OO,S,YT
    D=1
    OPEN "DAILY" RECL 50 AS 3
    IF END #3 THEN 870
    REM READ DAILY FILE FOR # OF RECORDS.
    READ #3,D;Y$,W,A,W$
    W=W+1:D=W
    PRINT #3,D;P$,R,Q,D$ REM RECORD SALE IN DAILY FILE.
    D=1
    REM INCREASE RECORD TOTAL IN FILE BY 1.
    PRINT #3,D;Y$,W,A,W$
    CLOSE 3
    CLOSE 2 REM RETURN FOR NEXT ITEM ON THIS SALE.
    GOTO 845
870 PRINT "NO DAILY SALES FILE."
    CLOSE 4
    CLOSE 3
    CLOSE 2
    GOTO 1000
    REM TOTAL SALES RECEIPT.
875 PRINT USING "TOTAL $$$,###.##";TAB(51);DT
    PRINT USING "TAX $$$,###.##";TAB(51);TAXT
    TOT=DT+TAXT
    PRINT USING "TOTAL $$$,###.##";TAB(51);TOT
    PRINT
    PRINT TAB(10);RMK$
    CONSOLE
    PRINT
    INPUT "HIT RETURN WHEN READY.";
    GOTO 1000

    REM DISPLAY DAILY SALES ACTIVITY.
880 GOSUB 900
    D=1

```



```

OPEN "DAILY" RECL 50 AS 1
PRINT TAB(20); "DAILY SALES REPORT"; TAB(65); DATES
PRINT
PRINT "ITEM #"; TAB(10); "QUANTITY"; TAB(20); \
"PART NUMBER"; TAB(33); \
"DESCRIPTION"; TAB(50); "PRICE"; TAB(65); "TOTAL"
885 D=D+1
IF END #1 THEN 890
READ #1, D; P$, R, Q, D$
ST=Q*R
RT=RT+ST
PRINT D; TAB(9); Q; TAB(20); P$; TAB(33); D$ \
; TAB(49); R; TAB(64); ST
TAXT=TAX*RT
TOT=RT+TAXT
GOTO 885
890 PRINT USING "TOTAL" $$$#,###.##"; TAB(43); RT
PRINT USING "SALES TAX" $$$#,###.##"; TAB(43); TAXT
PRINT USING "GRAND TOTAL" $$$#,###.##"; TAB(43); TOT
CLOSE 1
CONSOLE
PRINT
INPUT "HIT RETURN WHEN READY.";
GOTO 805

REM RECORD LAST INVOICE NUMBER IF TICKET# FILE.

895 IF SI=0 THEN 9990
OPEN "TICKET#" RECL 15 AS 1
D=1
PRINT #1, D; SI
CLOSE 1
GOTO 9990

REM PRINTER OPTION.

900 PRINT CHR$(26)
PRINT "DO YOU WANT A PRINTED COPY ? "
INPUT "Y = YES, N = NO"; PTR$
IF PTR$="Y" THEN LPRINTER WIDTH 80
PRINT CHR$(26)
RETURN

REM TURNAROUND SUBROUTINE.

1000 CLOSE 1
GOTO 805

9990 PRINT
PRINT "ARE THE BACK UP FILES CURRENT ?"
PRINT
PRINT "REMOVE DISKS FROM DRIVES BEFORE TURNING OFF POWER"
PRINT

9999 END

```

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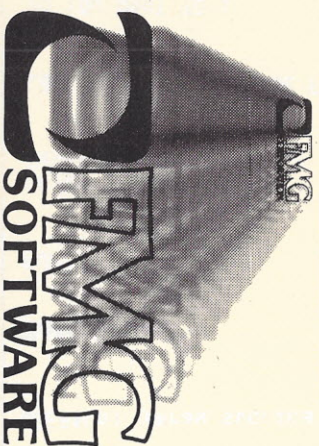
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## Bulletin Board continued from page 99

### Table of variables

A\$	Used to input responses, e.g. in INKEY\$ loops.
AN\$	Used to store response to yes/no questions.
HR	Current hour, input by user.
MN	Current minutes, input by user.
MS\$(n)	Array storing messages.
N-N7	FOR-NEXT loop counters.
NM	Number of messages.
NP	Number of people for whom messages have been left.
NP\$(n)	Array storing names of people for whom messages have been left.
PW\$(n)	Array storing passwords of authorized users.
RT\$(n)	Array storing password needed to retrieve MS\$(n).
T\$	Current time, rightmost eight characters of TIME\$.
USER\$(n)	Array storing names of authorized users of bulletin board.

### Sample run

```

RUN
                                00:00:12
ENTER CURRENT HOUR? 11
ENTER CURRENT MINUTES? 40
                                11:40:04
LOAD EXISTING MESSAGE FILE (Y/N) ? N
                                11:40:12
DO YOU WANT TO :
    1.) TURN ON BULLETIN BOARD
    2.) AUTHORIZE NEW USERS
  
```

```
ENTER CHOICE: 1
```

```
ENTER PASSWORD: ? BUSCH
```

```
MEET ME AT GUIDO'S AT NOON -- CATHY. 11:45:40
```

### Program listing

```

40 CLEAR 8000
50 DIM USER$(100),PW$(100),RT$(50),NM$(50),NP(50),MS$(100),NP$(50)

60 ' ***** SET CURRENT TIME *****

70 CMD"CLOCK"
80 CLS:PRINT:PRINT
90 INPUT "ENTER CURRENT HOUR";HR$
100 HR=VAL(HR$)
110 IF HR>24 GOTO 90
120 INPUT "ENTER CURRENT MINUTES";MN$
130 MN=VAL(MN$)
140 IF MN>59 GOTO 120
150 POKE 16451,HR
160 POKE 16450,MN
170 POKE 16449,0

180 ' ***** CHOOSE ONE LINE FOR YOUR OPERATING SYSTEM : *****

190 ' POKE 23461,0 : ' FOR NEWDOS 2.1
200 ' POKE 23886,0 : ' FOR TRSDOS 2.2/2.3
210 ' POKE 17257,0 : ' FOR NEWDOS 80

220 ' ***** MENU *****

230 CLS:PRINT:PRINT
240 INPUT "LOAD EXISTING MESSAGE FILE (Y/N) ";AN$
250 IF LEFT$(AN$,1)="Y" GOSUB 1520
260 CLS:PRINT:PRINT
270 PRINT "DO YOU WANT TO :";
280 PRINT "                                1.) TURN ON BULLETIN BOARD"
290 PRINT "                                2.) AUTHORIZE NEW USERS"
300 PRINT
310 PRINT "ENTER CHOICE :";
320 A$=INKEY$:IF A$="" GOTO 320
330 A=VAL(A$)
340 IF A<1 OR A>2 GOTO 320
350 ' ***** LOAD USER FILE FROM DISK *****

360 OPEN "I",1,"USERS"
370 INPUT #1,US
  
```



ENTER CHOICE: ? 1

11:40:22

HIT ANY KEY TO ENTER OR RETRIEVE MESSAGES

\*\*\*\*\* BULLETIN BOARD \*\*\*\*\*

NO MESSAGES FILED AT THIS TIME

11:45:30

DO YOU WANT TO:

- 1.) RETRIEVE MESSAGE
- 2.) FILE A MESSAGE

ENTER CHOICE: ? 2

11:45:35

- 1.) DAVID BUSCH
- 2.) CATHY BUSCH
- 3.) MICHAEL BUSCH
- 4.) ANYONE

ENTER NUMBER OF RECIPIENT : ? 1

ENTER MESSAGE: MEET ME AT GUIDO'S AT NOON -- CATHY.

11:59:00

HIT ANY KEY TO ENTER OR RETRIEVE MESSAGES

\*\*\*\*\* BULLETIN BOARD \*\*\*\*\*

1 MESSAGES FILED FOR :

DAVID BUSCH

11:59:10

DO YOU WANT TO:

- 1.) RETRIEVE MESSAGE
- 2.) FILE A MESSAGE

ENTER CHOICE: ? 1

11:59:14

- 1.) DAVID BUSCH
- 2.) FINISHED RETRIEVING MESSAGES:

```
380 : FOR N=1 TO US
390 :   INPUT #1,USER$(N)
400 :   INPUT #1,PW$(N)
410 :   NEXT N
420 CLOSE 1
430 ON A GOTO 620,450
```

440 '\*\*\*\*\* ENTER NEW USERS' NAMES \*\*\*\*\*

```
450 CLS:PRINT:PRINT
460 US=US+1
470 INPUT "ENTER NAME OF NEW USER :";USER$(US)
480 INPUT "ENTER PASSWORD FOR NEW USER :";PW$(US)
490 CLS:PRINT:PRINT
500 INPUT "DO YOU WANT TO ENTER ANOTHER USER ";AN$
510 IF LEFT$(AN$,1)="Y" GOTO 450
```

520 '\*\*\*\*\* SAVE USERS TO DISK \*\*\*\*\*

```
530 OPEN "O",1,"USERS"
540 PRINT #1,US
550 : FOR N=1 TO US
560 :   PRINT #1,USER$(N);",";
570 :   PRINT #1,PW$(N);",";
580 : NEXT N
590 CLOSE 1
600 GOTO 230
```

610 '\*\*\*\*\* TURN ON BULLETIN BOARD \*\*\*\*\*

```
620 CLS:PRINT:PRINT
630 PRINT @ 80,"HIT ANY KEY TO ENTER OR RETRIEVE MESSAGES"
640 PRINT @ 208," ***** BULLETIN BOARD *****";
650 A$=INKEY$
660 PRINT @ 336,STRING$(60,32);
670 IF MFLAG=0 PRINT @ 336," NO MESSAGES FILED AT THIS TIME ";GOTO 720
680 PRINT MFLAG;" MESSAGES FILED FOR :";
690 : FOR N2=1 TO NP
700 :   IF NP$(N2)<>" "PRINT NP$(N2)
710 : NEXT N2
720 : FOR N=1 TO 10
730 : NEXT N
740 IF A$="" GOTO 650
```

750 '\*\*\*\*\* ACTIVATE RETRIEVAL/ENTRY \*\*\*\*\*

```
760 CLS:PRINT:PRINT
770 PRINT "DO YOU WANT TO :";
780 PRINT "          1.) RETRIEVE MESSAGE"
790 PRINT "          2.) FILE A MESSAGE"
800 PRINT
810 PRINT "          ENTER CHOICE :";
```



```

820 A$=INKEY$:IF A$="" GOTO 820
830 A=VAL(A$)
840 IF A<1 OR A>2 GOTO 820
850 IF A=1 AND MFLAG=0 GOTO 620
860 ON A GOTO 880,1130

```

```

870 '***** RETRIEVE A MESSAGE *****

```

```

880 CLS:PRINT:PRINT
890 : FOR N4=1 TO NM
900 :   PRINT N4;"." "NM$(N4)
910 :   IF N4/10=INT(N4/10) GOSUB 1670
920 :   NEXT N4
930 PRINT NM+1;"." FINISHED RETRIEVING MESSAGES"
940 PRINT
950 PRINT " ENTER CHOICE :";
960 INPUT A$
970 A=VAL(A$)
980 IF A<1 OR A>NM+1 GOTO 960

```

```

990 ' ***** PRINT OUT MESSAGE IF PASSWORD MATCHES *****

```

```

1000 CLS:PRINT:PRINT
1010 IF A=NM+1 GOTO 620
1020 CLS:PRINT:PRINT
1030 IF RT$(A)="" GOTO 1060
1040 INPUT"ENTER PASSWORD :";PW$
1050 IF PW$=RT$(A) GOTO 620
1060 CLS:PRINT:PRINT
1070 PRINT MS$(A)
1080 PRINT
1090 PRINT "HIT ANY KEY TO CONTINUE"
1100 A$=INKEY$:IF A$="" GOTO 1100
1110 GOTO 880

```

```

1120 ' ***** FILE A MESSAGE *****

```

```

1130 CLS:PRINT:PRINT
1140 NM=NM+1
1150 : FOR N3=1 TO US
1160 :   PRINT N3;"." "USER$(N3)
1170 :   NEXT N3
1180 PRINT US+1;"." ANYONE"
1190 PRINT
1200 PRINT "ENTER NUMBER OF RECIPIENT :";
1210 INPUT A$
1220 A=VAL(A$)
1230 IF A<1 OR A>US+1 THEN GOTO 1210
1240 MFLAG=MFLAG+1
1250 LINEINPUT "ENTER MESSAGE :";MS$(NM)
1260 NP=NP+1

```

```

1270 : FOR N5=1 TO NP
1280 :   IF A=NP(N5) GOTO 1330
1290 :   NEXT N5
1300 NP(NP)=A
1310 IF A=US+1 THEN NP$(NP)="ANYONE":GOTO 1330
1320 NP$(NP)=USER$(A)
1330 T$=RIGHT$(TIME$,8)
1340 MS$(NM)=MS$(NM)+": "+T$
1350 IF A=US+1 THEN RT$(NM)=""NM$(NM)="ANYONE":GOTO 1380
1360 NM$(NM)=USER$(A)
1370 RT$(NM)=PW$(A)
1380 OPEN "0",1,"MESSAGES"
1390 PRINT #1,NM
1400 FOR N7=1 TO NM
1410 PRINT #1,CHR$(34);MS$(N7);CHR$(34);";"
1420 PRINT #1,NM$(N7);";"
1430 PRINT #1,RT$(N7);";"
1440 NEXT N7
1450 PRINT #1,NP
1460 FOR N=1 TO NP
1470 PRINT #1,NP$(N)
1480 NEXT N
1490 CLOSE 1
1500 GOTO 620

```

```

1510 ' ***** LOAD MESSAGES FROM DISK *****

```

```

1520 OPEN "I",1,"MESSAGES"
1530 INPUT #1,NM
1540 FOR N7=1 TO NM
1550 LINEINPUT #1,MS$(N7)
1560 INPUT #1,NM$(N7)
1570 INPUT #1,RT$(N7)
1580 NEXT N7
1590 INPUT #1,NP
1600 FOR N=1 TO NP
1610 INPUT #1,NP$(N)
1620 NEXT N
1630 CLOSE 1
1640 MFLAG=NM
1650 RETURN

```

```

1660 ' ***** PAGE SUBROUTINE *****

```

```

1670 PRINT
1680 PRINT "HIT ANY KEY TO SEE REST OF MESSAGE LIST "
1690 PRINT
1700 A$=INKEY$:IF A$="" GOTO 1700
1710 CLS:PRINT:PRINT
1720 RETURN

```



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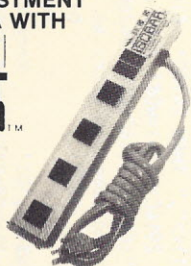
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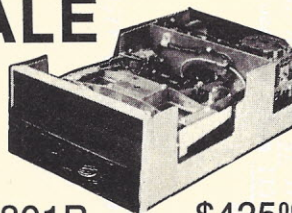
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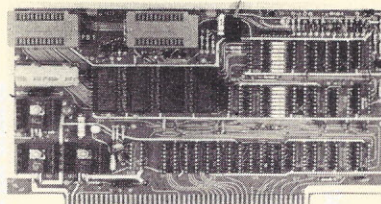
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Unused EPROM sockets don't take memory space, so you are never committed to the full 4K or 8K of memory.

#### SPECIFICATIONS

Memory capacity ..... 4096/8192 bytes (four sockets)  
Memory type ..... 2708 EPROM (not included)  
2716 EPROM + 5V type (not included)

Addressing:  
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programmer ..... Dip switch selection  
On-board ..... Any 4K/8K boundary above 8000 Hex  
EPROMs ..... Dip switch selection  
Unused sockets do not enable data bus drive  
Wait states ..... 0 to 4 clock cycles  
Buffering ..... All lines buffered  
Special feature ..... LED indicator for programming mode  
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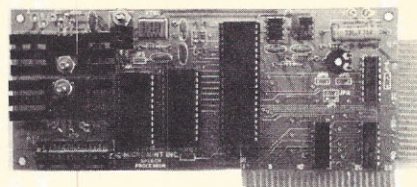
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## Stripping with CP/M's Editor

continued from page 100

### Program listings

**LISTING 1:** Here's a section of a mailing list program, heavily commented because it's designed to be user-proof and is therefore complex. Extensive remarks remove headaches from the program development process. Exact functioning of the program isn't important, but it is important that, to be edited by CP/M ED, it must have been saved in ASCII mode, by issuing the command, in Microsoft MBASIC, SAVE "PROGNAME",A.

```
22999 '
23000 ***ADDRESS
23010 LN=7:GOSUB 29100:IF TF<>0 THEN W$(3)=""':GOTO 23030
23015 IF GP<3 THEN GP=3' indicating address portion of sector filled.
23020 W$(3)=LEFT$(W$,20):W$=W$(3)
23030 GOSUB 29200:RETURN
23040 '
23999 '
24000 ***CITY ST ZIP
24020 LN=8:GOSUB 29100' Place cursor to prompt City(+ST(+zip)) entry.
24040 IF TF<>0 THEN W$(4)=""':GOTO 24420' User has no entry for this line.
24045 IF GP<4 THEN GP=4' Note sector is filled through 4th field.
24050 IF W$="p" THEN W$="P"' Both p & P OK as shortform Pittsburgh.
24060 IF W$="P" THEN W$(4)="Pittsburgh":W$(5)="PA":PF=1:GOTO 24320' Set PF.
24140 FOR L=1 TO LEN(W$):IF MID$(W$,L,1)<>"," THEN 24160' Find comma & pull
24145 W$=W$:W$=LEFT$(W$,L-1):GOSUB 29140:W$(4)=W$' city part & trim it.
24153 W$=RIGHT$(W$,LEN(W$)-L)):W$=""':GOSUB 29140:GOTO 24260'process rest.
24160 NEXT L' Reaching here = no comma in entry so it's city only.
24180 W$(4)=W$:W$=" > > <"+CE$:GOSUB 29200' Display & prompt.
24200 CL=35+LEN(W$)+2:GOSUB 29100' Receive ST(+zip).
24260 IF LEN(W$(4))>10 THEN W$(4)=LEFT$(W$(4),10)' Keep city < 11 chars.
24270 IF LEN(W$)>2 THEN W$(5)=LEFT$(W$,2):W$=RIGHT$(W$,LEN(W$)-2)):
GOSUB 29140:GOTO 24360
24280 W$(5)=W$
24320 W$=W$(4)+" "+W$(5)+" ":CL=35:W$=" > <"+CE$:GOSUB 29200' Prompt zip.
24340 CL=35+LEN(W$)+1:GOSUB 29100' Receive zip.
24360 IF LEN(W$)>5 THEN W$=RIGHT$(W$,5)' Trim zip.
24380 W$(6)=W$:W$=W$(4)+" "+W$(5)+" "+W$(6)+CE$:CL=35' Echo all.
24420 IF TF=1 THEN TF=0' TF may have become set by nul ST or zip entry.
24440 GOSUB 29200:RETURN' to main routine for more data, then correction run.
24999 '
```

```
22999 '
23000 ***ADDRESS
23010 LN=7:GOSUB 29100:IF TF<>0 THEN W$(3)=""':GOTO 23030
23015 IF GP<3 THEN GP=3'
23020 W$(3)=LEFT$(W$,20):W$=W$(3)
23030 GOSUB 29200:RETURN
23040 '
23999 '
24000 ***CITY ST ZIP
24020 LN=8:GOSUB 29100'
24040 IF TF<>0 THEN W$(4)=""':GOTO 24420'
24045 IF GP<4 THEN GP=4'
... etc.
```

**LISTING 4:** Now, to delete spacer lines that were included during program development to help spot program sections, we issue these commands:

Back to Beginning:

\*B

Key command:

\*#MF '^L^Z-1L1K

As many times (#) as possible, execute this Macro (multi-step) command: Find all instances of '^L (that is, a space followed by a '^ followed by a carriage-return-line-feed), and in each instance back up to that line (-1L) and Kill that one line (1K).

Result? Since only spacer lines contain the combination '^L, the spacer lines are now deleted throughout the file as in the sample below.

```
23000 ***ADDRESS
23010 LN=7:GOSUB 29100:IF TF<>0 THEN W$(3)=""':GOTO 23030
23015 IF GP<3 THEN GP=3'
23020 W$(3)=LEFT$(W$,20):W$=W$(3)
23030 GOSUB 29200:RETURN
24000 ***CITY ST ZIP
24020 LN=8:GOSUB 29100'
24040 IF TF<>0 THEN W$(4)=""':GOTO 24420'
24045 IF GP<4 THEN GP=4'
24050 IF W$="p" THEN W$="P"'
24060 IF W$="P" THEN W$(4)="Pittsburgh":W$(5)="PA":PF=1:GOTO 24320'
24140 FOR L=1 TO LEN(W$):IF MID$(W$,L,1)<>"," THEN 24160'
... etc.
```

**LISTING 5:** Now, another command removes all ' marks, no longer needed.

Beginning of file:

\*B

Key command:

\*#S'^Z^Z

Literal translation: Make this Substitution throughout (#) the file: For every '^, put in nothing instead. "Nothing" is represented by the absence of anything at all before the second '^.



**LISTING 2:** With only a partial listing for illustration purposes, here's the result of applying this series of commands. The symbol ^ indicates that the character which follows it is a control character, as in ^Z. The computer's responses are in boldface; yours are underlined.

Command (while in CP/M system mode): **A>ED PROGNAME.BAS**  
 In ED, computer's prompt is \*  
 Command to Append whole (#) file for edit: **\*#A**  
 Command to return to Beginning of file: **\*B**  
 Key command for this stage of process: **\*#S'\*\*\*^Z\*\*\*^Z**

Meaning: As many times (#) as possible,  
 Substitution: For every instance of **'\*\*** put in **\*\*\*** instead. In ED, ^Z delineates the end of a string of characters that are to be taken by the machine as such, and not as part of the command.

The result, shown below, is that the REMark delineator ' (single quote or apostrophe) is replaced with an asterisk in those key lines, such as jump targets or otherwise crucial remark lines, which were prepared by being tagged '\*\* instead of simply '. This will preserve these particular REMark lines in subsequent editing.

```
22599 '
23000 ***ADDRESS
23010 LN=7:GOSUB 29100:IF TF<>0 THEN W$(3)="" :GOTO 23030
23015 IF GP<3 THEN GP=3' indicating address portion of sector filled.
23020 W$(3)=LEFT$(W$,20):W$=W$(3)
23030 GOSUB 29200:RETURN
23040 '
23599 '
24000 ***CITY ST ZIP
24020 LN=8:GOSUB 29100'           Place cursor to prompt City(+ST(+zip)) entry.
24040 IF TF<>0 THEN W$(4)="" :GOTO 24420'       User has no entry for this line.
24045 IF GP<4 THEN GP=4'           Note sector is filled through 4th field.
... etc.
```

**LISTING 3:** Now we apply these commands:

Go to Beginning of file: **\*B**  
 Key command for this stage: **\*#MJ'^Z^Z'^Z**  
 This command, literally translated, says:  
 As many times (#) as possible, execute this Macro Juxtaposition command: Find every ', insert nothing after it (that's why the ^Z terminating the single-character string ' is followed immediately by another ^Z), and delete everything up to the next carriage-return-line-feed. The CRLF is represented by ^L in ED commands.

The result, in plain English, is the deletion from the file of anything that falls between any ' and any carriage return. In Microsoft's MBASIC, that is, in effect, the definition of a REMark. Note that the protected remarks, showing now as **\*\*\***, survived this edit as intended.

```
23000 ***ADDRESS
23010 LN=7:GOSUB 29100:IF TF<>0 THEN W$(3)="" :GOTO 23030
23015 IF GP<3 THEN GP=3
23020 W$(3)=LEFT$(W$,20):W$=W$(3)
23030 GOSUB 29200:RETURN
24000 ***CITY ST ZIP
24020 LN=8:GOSUB 29100
24040 IF TF<>0 THEN W$(4)="" :GOTO 24420
24045 IF GP<4 THEN GP=4
24050 IF W$="P" THEN W$="P"
24060 IF W$="P" THEN W$,4)="Pittsburgh":W$(5)="PA":PF=1:GOTO 24320
24140 FOR L=1 TO LEN(W$):IF MID$(W$,L,1)<>"", THEN 24160
```

**LISTING 6:** The process comes full circle. We restore the REMark status of the jump-target remark lines by replacing **\*\*\*** with ', using this command:

Command to return to Beginning of file: **\*B**  
 Key command: **\*#S\*\*\*^Z'^Z**  
 See listing 2 for translation.  
 Final command is to End the edit. **\*E**

And here is the final "stripped" program section.

```
23000 'ADDRESS
23010 LN=7:GOSUB 29100:IF TF<>0 THEN W$(3)="" :GOTO 23030
23015 IF GP<3 THEN GP=3
23020 W$(3)=LEFT$(W$,20):W$=W$(3)
23030 GOSUB 29200:RETURN
24000 'CITY ST ZIP
24020 LN=8:GOSUB 29100
24040 IF TF<>0 THEN W$(4)="" :GOTO 24420
24045 IF GP<4 THEN GP=4
24050 IF W$="P" THEN W$="P"
24060 IF W$="P" THEN W$,4)="Pittsburgh":W$(5)="PA":PF=1:GOTO 24320
24140 FOR L=1 TO LEN(W$):IF MID$(W$,L,1)<>"", THEN 24160
24145 W$=W$:W$=LEFT$(W$,L-1):GOSUB 29140:W$(4)=W$
24153 W$=RIGHT$(W$, (LEN(W$)-L)):W$="" :GOSUB 29140:GOTO 24260
24160 NEXT L
24180 W$(4)=W$:W$="" > > <"+CE$:GOSUB 29200
24200 CL=35+LEN(W$)+2:GOSUB 29100
24260 IF LEN(W$(4))>10 THEN W$(4)=LEFT$(W$(4),10)
24270 IF LEN(W$)>2 THEN W$(5)=LEFT$(W$,2):W$=RIGHT$(W$, (LEN(W$)-2)):
GOSUB 29140:GOTO 24360
24280 W$(5)=W$
24320 W$=W$(4)+" "+W$(5)+" ":CL=35:W$="" <"+CE$:GOSUB 29200
24340 CL=35+LEN(W$)+1:GOSUB 29100
24360 IF LEN(W$)>5 THEN W$=RIGHT$(W$,5)
24380 W$(6)=W$:W$=W$(4)+" "+W$(5)+" "+W$(6)+CE$:CL=35
24420 IF TF=1 THEN TF=0
24440 GOSUB 29200:RETURN
```



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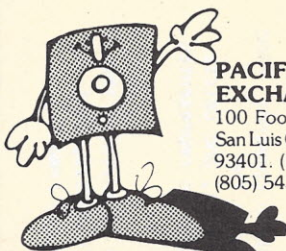
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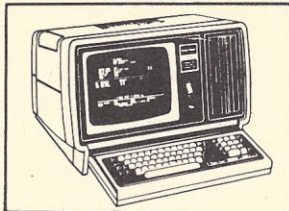
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Info Inquiry Number	Page	Info Inquiry Number	Page
<b>MANUFACTURERS</b>			
5	AEI . . . . . 43	72	Rochester Data . . . . . 56
6	A-T Enterprises . . . . . 99	73	Sorrento Valley . . . . . 50
7	Analog Tech . . . . . 36	75	Structured Systems Group Inc. . . . . 31
8	Ashton/Tate . . . . . 55	76	Supersoft . . . . . 4
9	Avant Garde . . . . . 54	77	Synertek Systems . . . . . 21
*	The CP/M Users Group . . . . . 27	78	Systems Integration . . . . . 96
11	The Community Computerist's Directory . . . . . 140	79	Systems Plus . . . . . 47
12	Compuserve . . . . . 24, 25	80	TEI . . . . . 65
13	Computer Case Co. . . . . 29	81	Tarbell . . . . . 41
14	Computer Co. of America . . . . . 115	82	Tecmar . . . . . 60
15	Computer Furniture & Accessories . . . . . 124	83	Transnet . . . . . 20
16	Computer Lab . . . . . 83	*	University Microfilms . . . . . 108, 116
17	Pacific Computer Brokers . . . . . 64	84	Vandata . . . . . 5
18	Computer Mart of New Jersey . . . . . 63	85	Vector Graphic . . . . . BC
19	Computronics Inc. . . . . 18	86	Vista . . . . . 32
20	Condor Computer Corp. . . . . 53	*	Western Electronics . . . . . 71
21	Continental Software . . . . . 91	131	Westland Electronics . . . . . 65
22	Cromemco Inc. . . . . 1	88	X-Comp . . . . . 111
23	Custom Computer (Computer Exchange) . . . . . 122		
*	Cybernetics . . . . . 61	<b>RETAIL</b>	
*	Data Dynamics Technology . . . . . 107, 113, 127, 133	89	Advanced Management Strategies . . . . . 79
24	Datasearch . . . . . 60	90	Adventure International . . . . . 143
25	Datasmith . . . . . 40	91	American Square . . . . . 121
26	Datasouth Computer Corp. . . . . 15	92	Avid Electronics . . . . . 134
27	Digital Graphic Systems . . . . . 30	*	Beta Computer Devices . . . . . 137
28	Discount Software Group . . . . . 22	93	Bits 'n Bytes . . . . . 144
30	Ecosoft . . . . . 30	94	The CPU Shop . . . . . 123
31	Electronic Control Technology . . . . . 38	95	Computers Etc. . . . . 119
32	Electronic Specialists . . . . . 50	96	Computers Plus . . . . . 132
33	Electronic Systems Furniture . . . . . 118	97	Computes Wholesale . . . . . 130
34	Ellis Computers . . . . . 11	98	Cornerstone . . . . . 126
35	Epson of America . . . . . 39	100	Disc/3 Mart . . . . . 146
37	Faircom . . . . . 112	101	FMG Corp. . . . . 151
38	Hayes Microcomputer . . . . . 7	102	Futra Co. . . . . 131
40	IMS International . . . . . 26	103	Long Island Computer . . . . . 146
42, 41	Infosoft . . . . . 111, 119	104	Micro Business World . . . . . 138
43	Inmac . . . . . 49	105	Micro Mike's, Inc. . . . . 75
44	Innosys . . . . . 8	132, 133,	Mini Micro Mart, Inc. . . . . 89, 117, 128, 145
45	Innovative Software . . . . . 120	106, 107	
46	Input/Output . . . . . 13	108	Olympic Sales . . . . . 142
47	Integrand . . . . . 19	109	Orange Micro . . . . . 125
*	Interface Age Subscriptions . . . . . insert between 32 & 33	110	Perry Gas & Oil . . . . . 139
49	Leading Edge . . . . . IFC	111	Personal Computer Systems . . . . . 136
50	Tom Lenz . . . . . 56	112	Poly Paks . . . . . 140
*	Lifeboat Associates . . . . . 3, 35	113	Priority One . . . . . 155
51	Lifelines . . . . . 51	114	Prosoft . . . . . 144
36	Lo-Ball Computers . . . . . 116	*	Rainbow . . . . . 129
53	3M . . . . . 9	115	Stoneware Microcomputers . . . . . 147
54	Malibu Electronics . . . . . 10	*	VR Data . . . . . 141
55	Charles Mann & Assoc. (Creative Discount Software) . . . . . 96		
56	Measurement Systems . . . . . 16, 17	<b>MICRO MARKET</b>	
57	Meta Technologies . . . . . 105	116	Creative Marketing Services . . . . . 159
*	Micro Applications Group . . . . . 42	117	Computer Resources Co. . . . . 158
58, 59	Micro Ap . . . . . 57, 109	118	Eigen Systems . . . . . 159
60	Microhouse . . . . . 114	119	Feith Systems . . . . . 159
61	Micro Mate . . . . . 54	121	Gateway Computer Center . . . . . 159
*	Microsette . . . . . 14	122	Leatherleaf Books . . . . . 159
62	Muse . . . . . 110	123	Magnolia Microsystem . . . . . 159
63	New England Business Systems . . . . . 87	29	Marymac Industries . . . . . 158
64	Novation . . . . . 12	124	Micro Architect . . . . . 158
65	OEM Software . . . . . 97	125	Owatonna Computer . . . . . 158
66	Okidata . . . . . 23	126	Pacific Exchanges . . . . . 158
67	Omega Sales . . . . . 59	127	Pan American Electronics . . . . . 158
68	Pickles & Trout . . . . . 38	128	Pelican Programs . . . . . 158
69	Prodigy . . . . . 101	129	Wall Street Software . . . . . 158
70	Quantex . . . . . 80	130	York 10 . . . . . 159
71	Racet Computes . . . . . 37		

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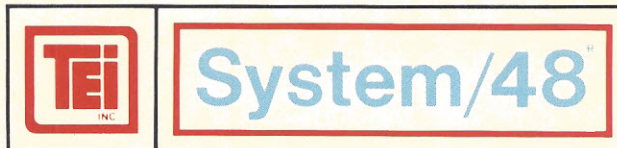
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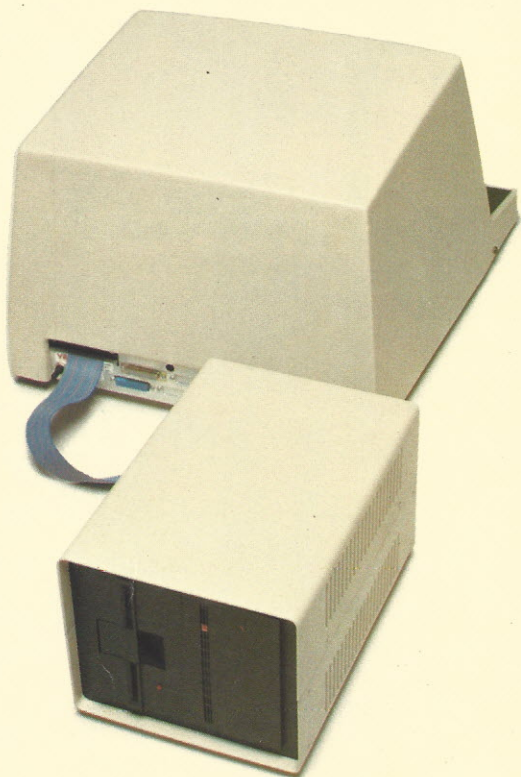
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